METAL INDUSTRY

WITH WHICH ARE INCORPORATED

ALUMINUM WORLD — COPPER AND BRASS

BRASS FOUNDER and FINISHER

ELECTRO-PLATERS REVIEW

VOL. 33 NEW YORK, MAY, 1935 No. 5

Spinning Sheet Metals

By W. B. FRANCIS

Mechanical Engineer

The Basic Principles, the Equipment Used and the Methods of Operation in This Old Art

SPINNING refers to the process of forming hollow sheet-metal shapes by applying pressure against one side of a rapidly revolving disc, and thereby causing the disc to shape itself over some desired form located back of the metal. The usual shapes are circular and elliptical with straight or conical sides or bottoms. Extra heavy work is spun by using roller tools against a stationary disc. The spinning process includes trimming, cutting, wiring, curling, beading, threading, and burnishing operations. Some kinds of articles require two or more mountings on different forms. A chuck or former supports the revolving disc, and has the shape desired on the finished article. The spinning process stretches and shapes or spins the thin and soft metal closely over the backing form, which may be either on the inside or the outside of the chuck. The chucks are made of hard wood, zinc, cast iron, brass, etc.

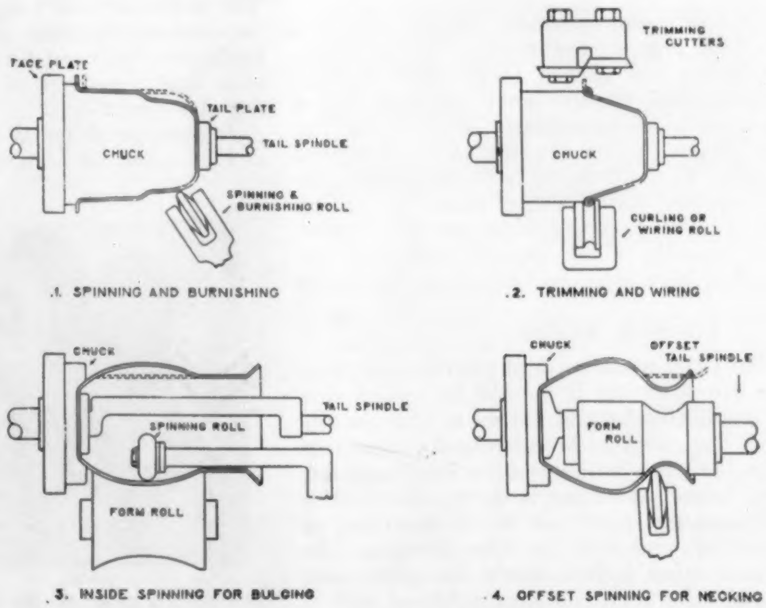


Fig. 1. Examples of Inside and Outside Spinning

The spinning of thin metals is an old-time art. It probably began with the use of copper, silver and gold, as these metals are of the earliest discoveries. Hammered copper vessels date from antiquity, and it was a natural process to originate spinning by primitive hand methods. However, the modern presses and die sets have largely taken the field where millions of duplicate pieces are to be produced. But spinning is still in vogue for the production of many articles with simple equipment. It is likely that much more spinning would be done if its advantages and possibilities were better understood, and the modern machines and metals and the details of spinning exploited as energetically as are the presses and dies.

Principles of Spinning

Examples of inside and outside spinning by the use of rolling tools are illustrated in Fig. 1. In (1) a chuck is screwed on the nose of the lathe spindle. This has an outside surface that registers with the inside surface on the piece to be made. The flat plate center on the tailstock spindle clamps the sheet disc against the end of the chuck. A round edge roller tool is mounted on the tool post of the lathe, and this spins and burnishes the flat disc to the form of the chuck. The projecting edge made as in (1) may be curled and wired by a grooved roll applied as in (2). The excess metal is cut off and the edge made straight by use of the revolving circular trimmer

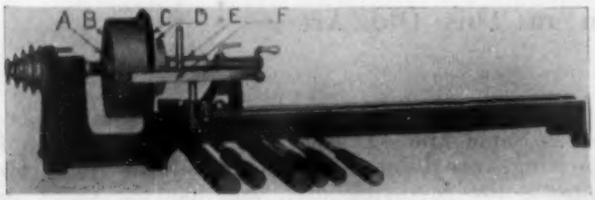


Fig. 2. Combination Wood Working and Spinning Lathe

cutter. In case the piece must be bulged outward, then it may be held against the shallow chuck by an extension arm and a flat center as in (3). Then a rounded roll is applied to the inner surface, and a form roll must be held against the outside of the piece. The inside roll spins the metal to the form of the outside roll. If the bulging is from the outside, as in (4), the required round shape must be located inside and held by the pressure from the flat center on the tailstock spindle. The outside roller in the tool post spins the bulge into the hollow of the inside roller.

Spinning Lathes

The lathe is the chief machine tool used in spinning. In order to do the spinning it should be noted that the making of wood chucks and forms is also an important part of the work. Metal chucks are also used where the soft metals will stand the hard backing, and where very heavy spinning is done. The lathe should be built and equipped for wood working as well as for spinning, and also for iron turning. In some shops combination lathes would be more economical, while in others two separate lathes would be better. The standard machine shop lathe is used by some, but where quite a quantity of spinning is done, it is better to use a lathe specially built for this service, and usually necessary.

A combination spinning and wood working lathe for small and medium sized work is illustrated in Fig. 2. This lathe has a gap bed so as to give a large swing, and at the same time have a rigid construction from a relatively light weight. For an extra large swing, the outer end of the spindle and a floor support for the tool may be used. All kinds of attachments and a complete set of tools for the requirements of varied spinning are supplied with the lathe.

A modern lathe for medium and large or heavy spinning is illustrated in Fig. 3. It is shown clear

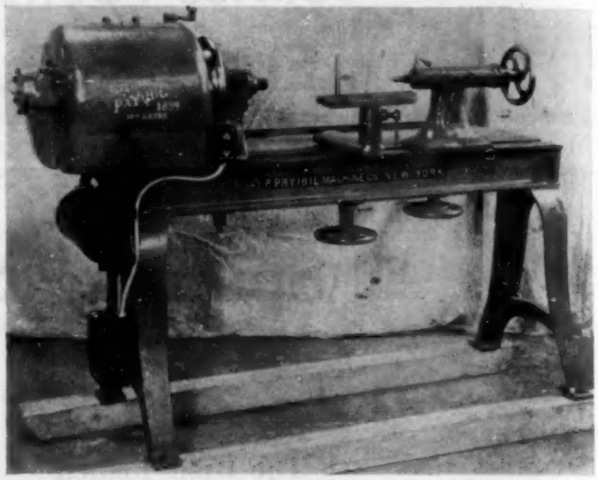


Fig. 3. Lathe for Heavier Work

of all attachments, which are available for all requirements. This lathe has a very rigid construction, and its motor is enclosed in the headstock. The spindle is mounted in radial and end thrust bearings. A long threaded nose on the spindle holds the threaded wood chucks or iron face plates. The tailstock has an extra long spindle that is arranged to take the tapered shanks of either flat or pointed ball bearing centers. The tool rest is a long flat plate with a row of holes to receive the pins against which the long handled tools are fulcrumed. The rest is adjustable lengthwise and crosswise of the bed, and for height and in angular directions.

A very substantial lathe, adapted both to turning and to spinning of large articles and heavy metals is

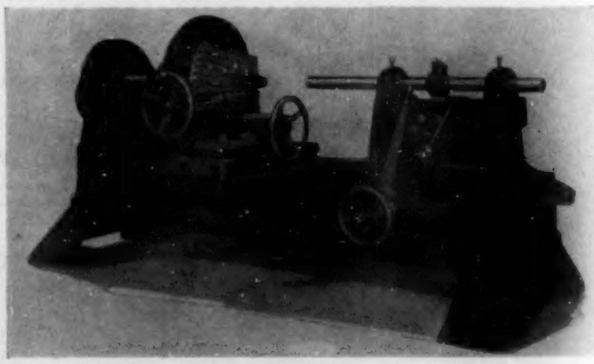


Fig. 4. Lathe for Large, Heavy Work

illustrated in Fig. 4. This lathe is fitted with a combination oval (elliptical) turning and spinning chuck. It has lever and wheel controls for applying very heavy pressures on the revolving discs.

Details of Spinning

Some common examples of spinning are illustrated in Fig. 5, and some of the wood chucks used to produce the articles are in Fig. 6. The action of the operator in spinning is illustrated in Fig. 7. He uses a long wood handled tool that reaches from the work back under his arm or on to his shoulder. The business end of the tool lies across the tool rest and fulcrums against a vertical pin while the operator exerts a heavy pressure against the revolving disc. Some of the tool ends in common use are illustrated in Fig. 8. These are of hardened steel and have very smooth and rounded surfaces. Hard wood pieces may serve for tools.

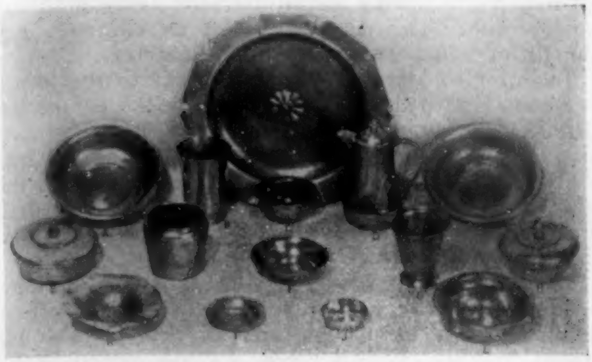


Fig. 5. Typical Spun Articles

The diameter of the disc must be such as to include all the area of the finished piece. Thus, for a pan 10 in. in diameter and 1 in. deep, and having a ½ in. rim, the disc must measure 10 + 1 + 1 + ½ + ½ = 13 in. If there are sloping parts, beads or curls, additional widths must be added to the circle. Something for trimming is also needed.

The metal must be in its softest condition. Pewter is naturally soft and spins easily without annealing. Aluminum can be purchased in its softest condition, but it hardens with spinning, and if considerable distortion is caused by the spinning tools it can be softened by heating to about 600 degrees F. and cooling slowly. Lubricate with yellow soap, mixtures of white lead and tallow, or with vaseline in these mixtures. Soft copper and brass stocks are available, but these metals harden quickly with spinning, and for some articles they may have to be resoftened two or more times during the process. Heat to a cherry red and cool either in air or water. Soft pure zinc rolled to from .02 to .05 in. thick is available for spinning. It will not stand as much stretching as copper and brass, and it is easer torn than aluminum. It works best while kept hot, and will not require special annealing if kept above 70 degrees F. by the action of the spinning tool. Use plenty of warm soapy water for a lubricant. For articles requiring considerable stiffness, use less pure zinc and do not attempt to form sharp corners.

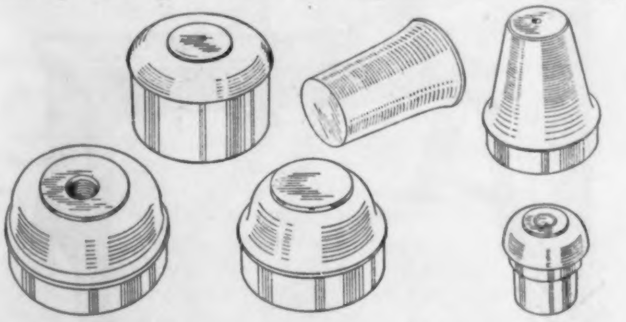


Fig. 6. Wood Chucks for Spinning

Stainless steels (chrome-nickel) of light gauges will spin, but requires more power than the non-ferrous metals. Lower speed works better, and a high heat is needed to anneal both to relieve stresses and to soften. Heating to about 2100 degrees F. and quenching in water is required by some stainless steels. Corners and bends must have large radii. A heavy lubricant made of linseed oil thickened with sulphur is recommended, as it can be washed off with hot water and soda ash. The metal must be clean when heated for annealing.

Fig. 7. Operator at Work, Spinning

Monel metal and nickel are stiffer than copper, brass and sterling silver. They harden rapidly in spinning. Nickel can be spun in more intricate shapes than can be made from monel. To anneal heat to about 1200 degrees F. and quench in water. Some recommend adding wood alcohol to the bath. These metals spin better over cast iron chucks than over wood. Use hard steel tools and lubricate with tallow.

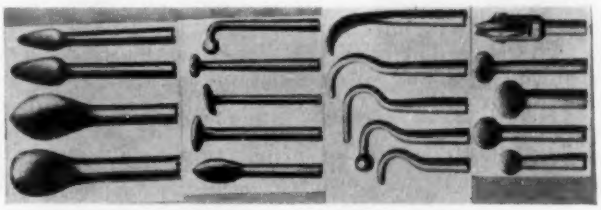


Fig. 8. Tool Ends for Spinning

Magnesium, or Dow Metal, is very light and can be spun to a moderate extent while cold. For greater depths, heavier pressures and the application of heat are necessary. The heat may be applied by a torch to the revolving sheet. The temperature range goes above 500 degrees F. Heating the tool is sometimes beneficial, and a roller tool may be necessary.

The producers recommend the use of carpenters' blue chalk as a temperature indicator. This chalk loses its color at about 600 degrees F. Lard oil is considered a good lubricant, as it stands the heat and can be removed easily by the use of alkaline cleansers.

Low carbon sheet steel is annealed by heating slowly to about 1450 degrees F. and cooling very slowly in the furnace or under cover. Tin must not be heated higher than boiling water. Beryllium copper must be made extra soft before spinning. This is

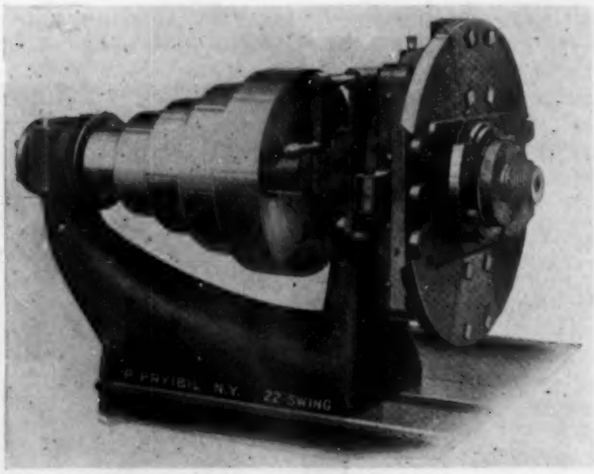


Fig. 9. Lathe with Oval Chuck

done by heating to 1450 degrees F. and quenching in water.

The presence of impurities and of alloys modify the annealing temperatures. Also the extent of the hardness that must be reduced is often uncertain, so that the temperatures for heat treating can not be given in advance. Those stated above are for general indications only. It will be noticed that steel requires slow cooling, while the non-ferrous metals take quick cooling.

The most important attachment for the spinning lathe is the chuck used to form elliptical shapes, which are so common in table and kitchen ware. This chuck is arranged so that the metal disc is mounted on a center that moves to and from the spinning tool during each revolution. It is called an "oval" chuck by the builders, and one make is illustrated in Fig. 9. The threaded nose that receives the wood forms with the attached discs is mounted on a slide that may move the nose any desired distance out of line with the lathe center. The nose of the lathe spindle is fitted with a driving arm having guides for the front part that may move out of line. There is also

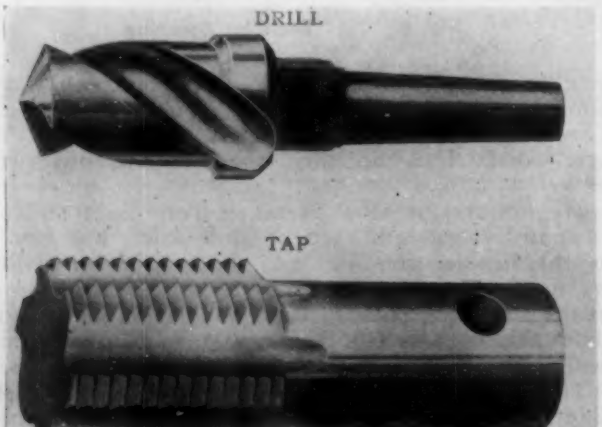


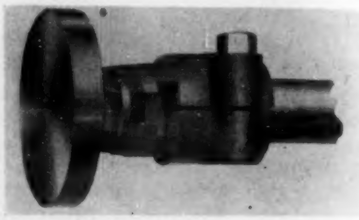
Fig. 10. Drill and Tap for Attaching Wood Blocks to the Lathe

an eccentric disc that is held stationary by the headstock, and a ring revolving on this disc is attached to the guides. The purpose of the eccentric disc is to permit adjustment of the amount of eccentricity required by the work, the adjustment being made by a hand crank. The eccentricity of an ellipse is equal the difference between its half diameters.

In order to attach the wood blocks to the lathe, it is necessary to drill and tap the blocks to the same thread as on the spindle nose. To do this a standard size drill and a corresponding tap, such as illustrated in Fig. 10 are required. Metal chucks such as those cast of zinc, cast iron, and brass, etc., must be drilled and threaded unless they are bolted to face plates that fit the spindle.

A flat plate attached to the tailstock spindle is needed where the metal disc must be held by pressure against the block. One form of this plate is illustrated in Fig. 11. All pieces having closed bottoms

Fig. 11. Flat Plate Attached to the Tailstock Spindle



must be held by pressure. Articles with open bottoms, or which may have screw holes may be fastened to the wood block by screws or clamps, and the tailstock is not needed.

Where an extra heavy pressure must be applied on account of a large article or one of heavy metal, a compound leverage is available, as illustrated in Fig. 12. This shows how a large dome-shaped piece is spun on a block that extends through the hole in

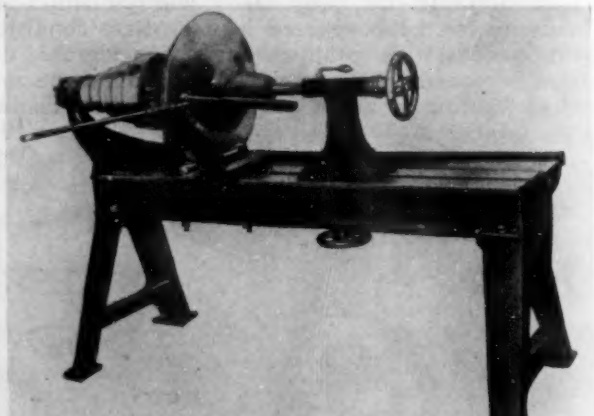


Fig. 12. Compound Leverage for Heavy Metal

the piece and is supported on the pointed center of the tailstock. The spinning pressure is applied near the center of the disc by the tool and gradually extended outward, the speed of shaping being slow enough to prevent wrinkling. A heavy flat surfaced bar must be held at the start against the back of the disc and opposite the location of the spinning tool to prevent wrinkling. The use of the backing bar is not necessary as fast as the area of the disc contacts the block.

Bearing Troubles

By A. HOYT LEVY
Vice President, United American Metals Corporation, Brooklyn, N. Y.

Why Bearings Fail and How to Avoid Such Failures

BEARING troubles, like our poor relations, will always be with us. And like the poor poodle that is blamed for every spot on the carpet, the babbitt in the bearing is the first to get the blame when the bearing goes down.

It is not my intention to "pass the buck," but my experience has convinced me that with intelligent care and a babbitt of a character suited to the service, made of pure metals, properly alloyed, the chances are that in the failure of the bearing, the fault is not due in any way to the babbitt.

There are so many reasons for bearing failures that it is not an easy matter to put your finger on the trouble spot. One reason for this is the fact that more often than otherwise, the evidence is destroyed with the failure, such as would be the case where the bearing runs out because the lining lifted from the back.

In most bearing failures, the babbitt was squeezed out of the box. This may have been due to the babbitt being too soft for the pressure or shock, in which event, the babbitt would be at fault.

But it may also be due to the fact that the babbitt lining lifted, or sprung away from the back and broke the oil-film. The metal-to-metal contact creates friction—which means that it generates heat causing the babbitt to soften and creep out.

But why should a lining lift itself away from the back? Because the box is not completely tinned; or it is not sufficiently anchored; or a smear of oil negligently left in the box prevented the tin from binding to the back and left an air space at that spot. Such things will almost surely lift the lining in time.

A close observer may be able to discover traces of a sprung lining in a bearing failure by examining what is left of the lining and the box. Where the lining did not bind to the back, the spot on both the lining and the box will have a cleaner appearance than other parts and may be taken as circumstantial evidence that here was the source of the trouble.

One way to overcome the babbitt lining from lifting away from the back is to line the bearing by spraying instead of casting the babbitt. By the spray method of babbitting, the box, which is first sand-blasted, requires no tinning as the minute indentations produced by the sand-blast serve as anchors. The babbitt, which is in wire form, is fed into a gun which drives a spray of the babbitt into the box. The original spray-gun, a German invention, has since been superseded by an American gun which is superior in several respects to its predecessor. Babbitting by spray-gun has several other advantages over the casting method, not the least of which is an assurance against hidden blow-holes.

In seeking the blame for bearing failure, the length of time between the installation and the failure merits consideration. Assuming that the babbitt is not at fault, if the bearing goes down shortly after the installation, make a careful examination of the shaft to see if it is out of round. Usually this is the last thing considered (if it is given any thought at all) when it should have first consideration. A shaft out of round will come in contact with the bearing in the same way that a high spot on the lining will come in contact with the shaft. Then, friction, heat—and out she goes.

Most of the bearing failures, I should say, are due to faulty lubrication. This fault covers a rather broad scope. It takes in the wrong grade of oil, impure oils and clogged oil-feeds. The grade of oil that should be used in bearing lubrication depends upon the service under which the bearing is to operate, the system of lubrication, the atmosphere in which it works and the climate. Definite advice may be obtained from almost any of the manufacturers of lubricating oils so there is no excuse for anybody using a grade that will cause bearing failure. True, when oil purchases are made on the price alone, when to save a small sum an impure oil is used and the sediment in the oil acts as an abrasive on the bearing, the fault for the failure lies entirely with the one who, "for want of a nail," lost a horse.

In this discussion of bearing failures, the surface has hardly been scratched. There are many other causes besides those touched upon here, most of them due to sheer negligence, carelessness and slip-shod work. This does not mean, however, that the babbitt is never at fault. A poorly alloyed babbitt, that is, one in which the ingredients are not evenly distributed, will have soft spots where the babbitt will go down and cause the whole bearing to fail. A babbitt made of lifeless, worn-out metals that have been through such service as old bearings, beer-pipes, old chemical tanks, toilet pipes, etc., will go under shock because of fatigue. It is hardly possible to know from an examination of the bearings, or even by chemical analysis, whether the metals used in the babbitt were pure and fresh. Only by a series of microphotographs can it be determined whether the babbitt had been made by merely melting the ingredients and mixing them or whether they were scientifically alloyed. And the expense of microphotographing every purchase would be well-nigh prohibitive.

The safest and soundest advice to those who use babbitt metal is to leave the selection to a reliable manufacturer who is acquainted with bearings and bearing problems and who will recommend a particular brand for the particular service.

Making Strong Brass and Making Brass Strong

By MICHAEL G. CORSON
Consulting Metallurgist, New York

Practical Considerations in Producing Brass Castings and Forgings. Part 3*

WE INDICATED in the previous article the combinations of ultimate strength and elongation available in the plain binary brasses and the conditions of work that should be adhered to in order to approximate those values in castings and forgings. Now we shall investigate the problem of increasing the ultimate strength values far beyond the limits attainable for a given binary brass, without at the same time lowering too much its ductility.

Tiny Additions Are of No Value

We shall begin with the statement that there is not the slightest chance of hardening a given brass by adding to it tiny amounts of some additional metal or a fluxing agent except in some rare instances. Traces of bismuth or tellurium, for instance, may ruin a good binary brass. However, even here the deleterious effect is rather specific in its action. A brass casting containing bismuth may be just as sound as one made of very pure brass, and its ultimate strength needs not to drop appreciably. The ductility however, will be impaired severely and any attempt of annealing or hot working will lead to a complete breakdown.

Be that as it may, one thing must be understood clearly. While certain impurities may ruin a good brass if present in traces, to improve a brass, to increase its strength, appreciable percentages of additions are needed.

There is a persistent idea, that a brass can be improved by scavenging and that the high strength of the manganese bronzes may depend upon the scavenging action of manganese. This idea is most pernicious. If a plain alpha brass can show an elongation of 50-65% it is evident that it is a perfectly sound brass and the same is true for a high brass (beta brass) if it possesses an elongation of 35%. On the other hand, nothing is easier than obtaining a low ductility and a low strength in a manganese bronze if it is carelessly made.

We have seen that a low brass (with less than 36% Zn), technically known as alpha brass (grains identical in type with the grains of pure copper) may not possess a higher strength than 48,000, while its elongation will closely approach the constant value of 65%. On the other hand a number of copper alloys of the binary kind show the same elongation with a considerably higher strength, which may reach 65,000. Beyond this figure no binary alpha alloy of copper goes, unless it is hardened by cold work or a special heat treatment.

*Parts 1 and 2 were published in our March and April issues.

Hence we shall identify one group of high strength brasses as comprising complex alloys in which the presence of the additional elements causes the strength to go up until it touches the mentioned value of 65,000 lbs. or so, without changing the structure of the corresponding plain brass and without lowering the elongation. This presupposes that the additional elements will enter into the structure of each grain of the plain alpha brass; in other words its atoms must be capable of substituting for the atoms of copper, just as zinc does, yielding in this manner what is technically called a solid solution of zinc and the additional elements in the crystals of copper.

With higher amounts of zinc we can reach even in a plain brass a strength of 77,000, while the elongation may go down to 37%. Such brasses are structurally known as duplex brasses or alpha plus beta brasses. Of the two structural elements the beta is the stronger and less ductile. The maximum of 77,000 identifies already a pure beta brass. Strange to say, the plain beta, while quite strong, possesses practically no elastic limit. The smallest stress will cause a permanent deformation in its grains.

What Addition Agents Can Be Used?

Hence our problem of obtaining strong brasses of the second group (duplex and beta) reduces itself to the following: We must find an addition or a set of additions which will strengthen the duplex brass of a given composition in one of the three ways possible:

(1) By hardening its alpha constituent.
(2) By hardening its beta constituent.
(3) By forming a new constituent of a high strength and good elongation, causing the cumulative strength of the complex brass produced to rise above that possessed by the plain binary brass used as its base.

Of these three logically possible ways, the third is the most difficult, if not hopeless, for a number of good reasons. The first two are comparatively easy, because there are a number of elements which will form a complex alpha brass and there exist also a small number of elements that will form a complex beta brass without materially changing the ductility of the plain brass taken as its basis.

Roughly speaking there are about 40 elements available for our alloy technique. Of these we must exclude copper and zinc because they are already forming the bases of our complex brasses. Further we must exclude eight precious metals for economic reasons; four others—mercury, antimony, arsenic and

bismuth—because their effects are known to be bad or inconclusive. Carbon is out, because it does not alloy with copper or brass. Consequently only 25 elements can be considered available in the brass foundry technique. These we shall group in four series as follows:

I	II	III	IV	V
(2) Aluminum	(9) Chromium	(13) Cadmium	(15) Calcium	(21) Molybdenum
(1) Beryllium	(10) Cobalt	(11) Magnesium	(17) Cerium	(22) Tantalum
(5) Manganese	(8) Iron	(12) Phosphorus	(18) Indium	(24) Thorium
(6) Nickel			(19) Lead	(27) Tungsten
(3) Silicon			(14) Lithium	(25) Uranium
(7) Tin			(16) Zirconium	(20) Vanadium
(4) Titanium				

Elements of the fifth group do not normally alloy with copper or brass. Intricate methods must be used to produce even rough mixtures and these do not show any increase in strength in comparison with plain copper or a binary brass. Again the prices of pure thorium, uranium or vanadium would preclude their use in copper alloys.

Elements of the fourth group do not dissolve in either the alpha or the beta brass. They either form compounds with copper or stay alone, and in both cases they exert no toughening influence, though the hardness may slightly increase.

Elements of the third group are slightly soluble in the alpha constituent of brass and do produce a tiny increase in its strength. They are incapable of forming complex beta brasses and their presence in such beta brasses is a negative influence.

Elements of the second series are slightly soluble in alpha brass but insoluble in beta. They exert a slight hardening effect upon the first but none upon the second. The first effect can be increased by a proper heat treatment—but for the foundryman this is not of much value or concern.

Iron, chromium and cobalt for some good reasons do not affect injuriously any binary brass even if present in considerable amounts, in spite of their strong tendency to segregate. However, the brass foundryman will do better in leaving all of them out of consideration.

There was a time, when iron was considered a fine hardener for duplex brasses. This opinion was based partly upon wish-fullfillment, partly upon considerations far less valid. The idea was that since iron is the basis of steels it ought to impart the properties of steel to brasses. But even in steel, it is the carbon, not the iron that produces high strength. Pure iron is but little stronger than pure copper and it takes a highly carburized iron to compare in strength (when annealed) with a plain beta brass of 77,000 lbs.

This is how, by the process of elimination, we come to the meagre number of seven elements of the first column among which may be forced the potential hardeners for brasses.

Here again we may safely dispose of beryllium due to its high price. Whether it will be important for wrought brasses and special applications is a different question. But it certainly does not come into consideration for ordinary castings and forgings.

In the same manner we can dispose of titanium. Like beryllium it is a very potent hardener for copper and a potential hardener for brasses. But its price (in the pure state) is too high. In the presence of impurities—even of the nitrogen of the air it does not alloy with copper at all. So titanium is out.

Silicon and Tin

Silicon dissolves well in alpha brass and can harden it considerably. It would be logical enough if a brass of let us say 15% zinc and 3% silicon remained an alpha brass, and had its strength raised to 65,000 without any drop in elongation. This is actually happening for the mentioned composition in the wrought state. However, in castings and forgings conditions become more intricate. Metallurgists indicate this situation by stating that the alloy is too far from the state of a structural equilibrium. We can obtain the indicated strength and even exceed it—going up to 70,000, but the elongation will decrease far below the constant of 65%; perhaps to 25%; and the structure will be changed as well. Such a complex silicon brass cannot be properly termed an alpha brass any more.

In the beta brass, silicon does not dissolve at all. The smallest amount of it—say 0.2%—will lead to a reduction in the ductility of the brass.

And so, we must conclude, that while silicon can be and actually is used to toughen alpha brass it does not really help to produce a high strength brass. For instance, brass used for casting propellers must not show less than 80,000. Nothing comparable can be obtained by the use of silicon.

What has been said about silicon is almost fully applicable to tin. Again, it ought to be possible to obtain a complex tin brass with let us say 20% Zn and 6% tin with 65,000 lbs. and 65% elongation, but nothing like that takes place. Again the reason lies in the structural changes causing the alloy to deviate greatly from the state of equilibrium. Therefore, only small amounts of tin can be safely and usefully added to an alpha brass intended for castings or forgings.

Tin is also slightly soluble in beta brass and so it adds slightly to the strength of the latter. Tobin bronze, for instance, in its original composition has been slightly stronger than the corresponding plain duplex brass due to its content of 1% of tin. The additional strength, however, is measured in a few thousand pounds, a rather indefinite strengthening.

And so, our sumptuous list of 25 elements that might be added to brass in order to strengthen it in a commercially useful manner is reduced to two elements (Si and Sn) and to three more, whose influence we are still to discuss.

This article will be concluded in an early issue. —Ed.

Direct Rolling of Brass

By W. A. WOOD
Consulting Engineer, New York

Direct Rolling is Not a New Idea. Improved Efficiency and Lower Costs Can Also be Obtained by Other Methods

RECENTLY, in the technical press was published an article describing and illustrating a continuous casting and rolling process for both ferrous and non-ferrous metals; also giving free prophesies of its revolutionary effects in both industries.

The principle, of course, is not new, particularly to the non-ferrous industry. More than 20 years ago the Continuous Casting Company of Garwood, N. J., operated a brass plant with a similar process, and under the stimulus of the World War demand and prices, did a large business, particularly in rods of some 3" diameter for ammunition purposes. The hot metal was cast directly into a moving die, made up of 2 vertical and continuous conveyors or chains, each link of which was half a die coming together and forming a sort of centipede round die several feet in length, sufficient for cooling or setting purposes.

The product bore die marks which were removed in one operation by scalping in a drawbench, and during the war, were shipped with such a surface.

As compared to the present cold rolling methods of breaking down and running down, the proposed new continuous process is revolutionary to America, but not to Germany or Russia and possibly not even to Japan, for they practically abandoned cold rolling years ago.

There are, of course, arguments pro and con on the relative value of both the hot and cold processes. The issue now is between the two hot processes, and resolves itself into a matter of cost and the phases which directly affect costs. The consolidation of two or more operations into one is always desirable if the object aimed at is obtained without too many sacrifices or complications which tend to defeat the very purpose of consolidation.

Apropos of this is an experience at Great Falls, Mont., in the building of the Anaconda rod wire and cable plant. It was urged to place the mill next to the refinery so that hot bars could go directly from the casting wheel into the rolls and so save the furnace operation of re-heating. This was in itself a suggestion of merit but it meant that the two distinctive and separate operations must synchronize at all times or trouble in one department would cause interference and a shut-down in the other. For that reason it was decided to drop the plan.

The modern non-ferrous casting shop, equipped with electric furnaces and "Junker" water cooled molds and other accessories, is most efficient and can cast slabs at a lower cost than by pouring a casting into a live mill. Such a common size of slab is 24" x 30" x 3" thick, weighing approximately 700 pounds and rolled in one heat to 5/32" in 8 passes. In a mill of large tonnage, with a crew of 6 men including furnace men, this can be carried on at such a low cost that a royalty as low as ⅛c per pound could not be of interest.

The German and Russian practice of hot rolling makes possible great economies also in cold rolling. The hot rolled coil of 24" width weighing approximately 700 pounds is entirely too heavy for manual handling, so mills are designed to take advantage of mass production by using conveyors, transfers, special inlet and exist accessories at rolls, strip annealing, pickling, slitting, etc. All metal flows forward in sequence practically on the floor level with no overhead handling devices. Cranes are used for repair only. Four-high and cluster mills are used both for heavy reduction and speed. The flow of metal is in a straight line toward the end where the narrowest and thinnest strip is produced, with larger widths and thicker gauges taken off to the sides for their finishing. This is similar to a water system with its main line and branches.

With the Russian system of national planning it is possible to concentrate mass production into one or more units, but in America with its larger volume it is also possible for any enterprising corporation to incorporate such economies and practically control such production in view of the obsolete methods now generally in practice.

Non-Ferrous Scrap Metals and Melting Practice In the Washington Navy Yard

By M. W. von BERNEWITZ
Metallurgist, Washington, D. C.

The Importance of Orderly, Systematic Sorting and Control of Scrap Metal*

Importance of Scrap Metals

ONE of the greatest factors in the production and market prices of virgin, new, or primary metals is the collection, sorting, and more or less refining of scrap metals, and the sale and return of secondary metals into circulation. Properly refined scrap is equal to primary metal for any purpose; in fact, some foundrymen consider it superior because of the intimate mixture of the component metals of alloys. A smelter in the United States and one in Australia made this similar statement to the writer. The subject of scrap is the great "blind spot" of the world's metal economy and until its importance is recognized, effective adjustment of supply and demand in the metal industries will remain difficult or impossible.

The large return of secondary metal in certain industries has made it possible for some business organizations to supply their needs for raw metal entirely or partly by scrap originating from their own operations. The United States Navy Yard at Washington, D. C., which the writer recently visited and was permitted to collect these notes, is an example. The term "secondary" there paradoxically means clean, primary scrap which is returned to the foundry. Only new metal is used with it in castings. During 1934 primary metal scrap, originating within the works, was used as shown below in Table 1.

Source of Scrap Metals

Borings, cuttings, shearings, turnings, and discarded material originating within the Navy Yard and from other Government Departments within the District of Columbia comprises the scrap metals. Foundry ash and shop sweepings form a not unimportant portion; the former contains spillage and droppings of metal which is concentrated out by those who buy the material, and the sweepings, before being sold, are burned to remove oil and paper. In the orderly scrap-yard, iron and steel make big piles, but the sheds or bins of aluminum, brass, bronze, copper, monel metal, and other metals make a large and colorful showing. Lead-sheathed copper wire has the lead melted off and pigged, and the wire is baled. Both are used in the foundry, as are the baled aluminum and brass turnings. Bales of aluminum weigh 20 pounds, cartridge brass 30 pounds, and copper 40 to 50 pounds.

*Previous articles: 1. Collection and Treatment of Non-Ferrous Scrap Metals in the Pittsburgh District: **Salvage** (New York), October, November, December, 1929. 2. Scrap Metals and Secondary Metals in Australia and New Zealand: **Chemical Engineering and Mining Review** (Melbourne), April, 1934.

Disposition of Scrap

All of the non-ferrous scrap, excepting the clean metal mentioned, is sold twice a year as " 'condemned material,' 'by sealed bids,' 'publicly opened.' " The last sale was on March 7, 1935, and the one prior to that on August 9, 1934. The conditions and terms of sale are strictly followed. Upon completion of sale, the Navy without charge loads the scrap onto railroad cars or other conveyance and weighs it. If any special loading is required, a charge is made.

Following is the accumulation of scrap offered for sale on March 7, 1935, ferrous metals excluded:

Scrap Metals Offered for Sale

Designation	Estimated quantity, pounds
Aluminum alloy turnings	40,000
Bearing bronze turnings	35,000
Brass scrap (miscellaneous)	50,000
Brass turnings (miscellaneous)	25,000
Bronze turnings	75,000
Cartridge-case chips	25,000
Cartridge-case dross	50,000
Cartridge cases (burned)	100,000
Copper, scrap (contaminated)	25,000
Foundry ash	70,000
Ferrous and non-ferrous mixed scrap	70,000
Manganese bronze turnings	50,000
Non-ferrous ingots (unidentified)	30,000
Shop sweepings (burned)	100,000

These lots total more than 350 tons. Other sales have included lead battery plates, emery grindings, monel metal, and nickel silver.

Foundry Practice

The non-ferrous foundry melts 850,000 to 1,050,000 pounds of aluminum, brass, cartridge-case, and other metals monthly. Half of these consist of clean scrap from the yard, as described. Gates, runners, and sprues from castings are sand-blasted and re-melted. Three shifts are worked, there being six melters and

Table 1. Primary Scrap Returned to Foundry

Source or condition	Aluminum	Antimony	Copper	Lead	Nickel	Tin	Zinc
	Metal, pounds						
Recovered or re-melted and used as such	206,108	...	68,650	97,375	......	......	16,173
Metal content of recovered or re-melted alloys	12,956	219	1,331,126[a]	125	113,411	102,300	170,783[b]
Brass re-melted (average copper in brass 70 per cent)	.....	...	4,062,661	.....	......	......	......

a—Other than brass. Clean copper and brass scrap constituted 40 per cent of the new scrap.
b—Other than brass.

two helpers a shift. In a new building are two high-frequency electric furnaces on cartridge-case metal, and eight crucible furnaces in a straight line, with a stack, on other metals. In the main foundry are two batteries of sixteen crucible furnaces each, in a semi-circle, with a stack for each battery. The draft is natural and draws well. In front of the furnaces, which are level with the floor and have sliding tops, is a grating which covers a pit through which the furnaces may be cleaned out and ash removed to outside of the building.

The furnaces are 24 inches in diameter and each takes a number 275 crucible which holds about 700 pounds of brass. It sits on firebrick which rests on the grate-bars. Egg anthracite is the fuel. Most of the pots used are of carborundum, but graphite crucibles are also used. A recent test of the former's life, melting an 88:10:2 copper-tin-zinc alloy, gave 53 heats for a number 225 and 83 heats for a number 80. Excepting melts of aluminum or its alloys, of which there are many, a cover of charcoal is shoveled onto the charge to prevent oxidation. The melting practice is simple, orderly, and carefully done.

Acknowledgments

The writer is indebted to J. R. Defrees, Rear-Admiral, United States Navy, Commandant and Superintendent of the Naval Gun Factory, for permission to visit the scrap-yard and non-ferrous foundry; and to Victor S. Jackson, Captain, Supply Corps, United States Navy, for information and arranging for the inspection.

Newark Platers Hold Big Annual Meeting

By Dr. A. KENNETH GRAHAM

The Fifteenth Annual Banquet and Educational Meeting of the Newark Branch of the American Electro-Platers Society was held in Newark, N. J., at the Hotel Douglas on Saturday, April 27th. Two educational sessions were held, morning and afternoon, and the banquet in the morning.

Benjamin McGar of the Chase Brass and Copper Company, Waterbury, Conn., presented the first paper in the morning session, devoted to a discussion of the developments in manufacture of brass. The author sketched the history of the development of furnaces up to the modern electric furnace, pointing out how economies had been effected by increasing the scale of operation per unit. He next discussed the various procedures that have been employed in rolling and showed the possibilities of the most recent development employing one set of rolls and automatically passing the metal back and forth from coils on either side of the rolls until the desired gauge was obtained. Mention was also made of the more recent annealing practices involving continuous annealing ovens employing controlled atmospheres of various kinds. The possibilities of using inert atmospheres for the production of the bright annealed surface was emphasized.

Donald Wood of Reed and Barton presented the second paper in the morning session, devoted to experiences in bright silver plating both of white metal and nickel silver. The importance of controlling the grain size of the base metal as it affects the brightness of the deposit was discussed. In view of the fact that white metal is frequently given a larger grain size than desirable, in order to permit easy fabrication, the production of a bright silver plate could still be accomplished provided a flash of tin was given prior to silver plating. This flash coating prevented the silver deposit from showing the coarse structure of the base metal. The appearance of smudged deposits at certain times was traced to the accumulation of foreign materials in the cleaning solutions. The throwing power of the bath was shown to vary with respect to temperature, current density and cathode polarization in a manner that would not necessarily be expected according to published theoretical considerations. Mr. Wood's paper in general was a review of experiences which raised a number of very interesting points and prompted considerable discussion.

In the afternoon session, Paul W. C. Strausser of the Bureau of Standards, presented an outline of the dropping tests that had been developed for testing the thickness of the plated coatings, details of which have appeared in **Metal Industry** (April, p. 133-4). Mr. Strausser made the plea that manufacturers try these tests and offer their constructive criticism to the Bureau in an effort to further perfect them.

W. M. Phillips, of the General Motors Research Laboratory, gave a very interesting exhibit of plating solutions in operation. By projecting the plating operation upon the screen it was possible to show the effect of addition agents at both electrodes in nickel plating, acid and cyanide copper plating and chromium plating. It has been the writer's privilege to witness this demonstration on two occasions, and in both cases the questions that were asked and the interest shown by the audience should justify the unusual amount of effort required to put on this exhibit. The General Motors Company is to be congratulated on this educational feature.

The Banquet was a cheerful affair, as is usual in Newark, attended by over 225 members and guests.

Correction

In our April issue we published an article Dropping Tests for Electroplaters, page 133-4. A small typographical error appeared on page 134, column 2, line 8, in which it was stated: "These results show that the method (for zinc coatings) is applicable with an accuracy of about + 10 per cent . . . ". The figure should have read "± 10 per cent."

Silver Plating to Specifications

By DR. C. B. F. YOUNG*, and S. C. TAORMINA[1]

The Conditions Necessary to Produce a Specified Thickness of Silver Deposit in Commercial Operations

Part I

THERE is at present a very strong demand for silverware plated to specification. In order to produce such work economically certain requirements are necessary. These are:

1—A practical method of controlling with acceptable accuracy the many variables existing in electroplating, so that a desired pennyweight per square foot of surface plated may be obtained.

2—A method of control which will not disrupt the plating department's routine.

3—A method which will not destroy the product being tested.

A number of tests by the authors show that it is possible to attain a satisfactory practical control of silver plating to specification.

The factors (besides cleaning of work) that enter into silver plating to specification, and directly affecting the results are:

1. Composition of solution.
2. Current density.
3. Time plated.
4. Cathode and anode efficiency.
5. Type of finish (bright buffing or satin finish).

The solution can be easily controlled by analysis, and must be kept to a correct standard at all times.

To obtain a certain amount of silver on a cathode is comparatively easy, but to devise a method where one can obtain a known amount of silver on a loving cup or serving tray in the same bath is not so easy. Let us assume that it is desired to produce silver plated ware containing 8 grams of silver per square foot of exposed surface. Thus, a cocktail shaker which has an area of 2 sq. ft. should obtain a deposit of 16 grams of silver. At 100% cathode efficiency it will be necessary to deliver 4 ampere hours to the article to obtain the desired amount of silver. How are we going to know when 16 grams of silver has been plated on the above article? If the area is known, an individual ampere hour meter would solve the problem. But this is impractical, as:

1. The area of each individual piece of work would have to be determined.
2. Each piece in the tank would require a separate ampere hour meter.

To find the area of hundreds of various shaped and sized articles manufactured by a modern hollow-ware firm would be a long, tedious and unwelcome task. Purchasing an ampere hour meter for each article in the tank would be impossible.

With this in mind the authors set out to find a method whereby the amount of silver plated on an article could be determined cheaply, accurately and rapidly.

From a theoretical consideration an article in a bath receives current in proportion to its size, other things being equal. For instance, a sheet of metal having 2 sq. ft. will receive twice as much current as a sheet having 1 sq. ft., provided the two pieces are equi-distant from the anodes and each piece has a corresponding anode area. Thus, if a tank is in operation, and a pilot, of known area, connected in series with an anode and cathode bar, is introduced, the current density of the pilot can be calculated. This will also give an indication of the current density of all the articles in the tank. This paper shows the relation between the current density of the pilot and the work.

The authors, in the following tests, used a 3″ x 6″ pilot which was a sheet of copper-nickel alloy, in series with an ammeter and the cathode bar.

Temperature affects the current efficiency, and while, in the following tests, temperatures were recorded, no attempt was made to include the effects in the results. Except for places where the temperature drops very low in cold weather, the average temperatures maintained in each place will not vary significantly. At any rate extremes should be avoided.

The amount of silver buffed off in the final operation must be allowed for while plating. This loss varies with the amount deposited, shape of the article, current density and the polishing compounds used. This factor must be determined empirically and taken into consideration when calculating the plating time or current density.

Part II

Tests were conducted with over 100 samples of work under various conditions and combinations. In these tests a 175-gallon tank was used with two cathode and three anode bars. The solution was maintained according to the following composition:

Silver Cyanide	4.0 oz./gal.
Free Sodium Cyanide	3.0 " "
Sodium Carbonate	6.0 " "

The first tests were run to see if the pilot (3″ x 6″), total area of 36 square inches both sides, would give a fair indication of the average current density with respect to any piece of work. A number of tank loads of work were plated. In this case the tank was loaded with the general run of work. No effort was made to impose any special conditions with reference to current density and amount of silver to be deposited. No areas of the work were taken with the exception of one piece (226 sq. in.) placed at random in the tank. Care was taken to see that the pilot and the 226 sq. in. piece of work remained in the tank the same time. The silver deposited in all cases was determined by difference in weight of cathodes, and checked by chemical analysis. The results were:

*Technical Director, U. S. Research Corporation, Long Island City, New York, and Instructor of Chemical Engineering, Columbia University, New York.

[1]Service Engineer, U. S. Research Corporation.

Table I

Run No.	Pilot No.	Work No.	Amps per Sq. Ft. on Pilot	Amp. Hrs. per Sq. Ft. on Pilot	Grams of Ag./Sq. Ft. on pilot	Grams of Ag./Sq. Ft. on Work	Pilot Efficiency in %	Working Efficiency in %
1	1	1	.90	.90	3.62	2.54	100.0	70.5
2	2	2	.86	.86	3.33	2.84	96.0	81.0
3	3	3	.86	.86	3.52	2.97	102.0	84.3
4	4	4	1.00	1.00	3.90	3.84	97.5	96.0
5	5	5	.80	.80	3.40	2.65	103.0	82.0
6	6	6	.88	.88	3.30	2.02	97.0	59.0

Time plated = One hour.

It may be assumed from the above that the cathode efficiency of the pilot was very close to 100%. However, the average efficiency of work itself was 79.5% compared to the actual current delivered to the pilot. These results, therefore, suggested further investigation to find a ratio between pilot efficiency and work efficiency that could be practically applied.

Several more tests were run with the same sized pilot. The conditions both as to time plated and current density were changed however. A piece of work with a surface area of 226 sq. in. was placed, as before, in the tank containing a batch of work. No other areas were taken. Results of this test follow:

Table II

Run No.	Pilot No.	[illegible]	Amps. per Sq. Ft. on Pilot	Time plated in Min.	Amp.Hrs. per Sq. Ft.	Grams of Ag./Sq. Ft. on Pilot	Grams of Ag./Sq. Ft. on Work	Pilot Efficiency	Work Efficiency
1	1		2.0	30	1.00	3.70	3.50	92.5	87.4
2	2		2.4	70	2.80	9.95	8.15	88.5	73.0
3	3		3.0	35	1.75	6.50	5.97	93.0	85.0
4	4		2.0	55	1.83	6.95	4.75	95.0	65.0
5	5		2.0	27	0.90	3.57	2.00	99.3	55.0

The above tests still show a high average efficiency for the pilots, (93.3%), but varying for the work and averaging 73.1%; a very close check on Table I. It can be assumed from these results that varying current densities up to 3 amperes, and time, has little effect on the efficiency of the tank as a whole.

With the relationship determined between the pilot and one piece of work, it was now necessary to establish a ratio between the pilot and all the work in the tank. In order to establish this ratio, ten pieces of identical work, each containing 226 sq. in. were chosen. These were placed in a tank along with the standard 3" x 6" pilot. The pilot was placed in different portions of the tank during the run. The results of the test follow:

Table III

Work No.	Average Ampere Hrs./Sq. Ft.	Grams of Silver Deposited	Grams of Ag./Sq. Ft. of surface	Work Efficiency Percent
Pilot A	1.8	1.8	7.1	99.0
1	1.8	11.4	7.4	100.2
2	1.8	10.8	6.9	96.0
3	1.8	11.5	7.3	100.3
4	1.8	11.4	7.3	100.2
5	1.8	12.7	8.1	113.0
6	1.8	10.9	7.0	97.0
7	1.8	9.2	5.9	82.0
8	1.8	10.9	7.0	97.4
9	1.8	9.5	6.1	85.0
10	1 8	10.4	6.6	93.0

Total area = 19.2 sq. ft. Total current = 35 amps. Time plated = one hour. Factor used: 4 grams of silver should be deposited per ampere hour. Therefore, for 100% efficiency, each of the above plates should have 7.2 grams of silver per square foot—the amount of silver deposited in strike ignored.

The results of Table III are very significant inasmuch as the efficiency of the work averaged 96.4%. The work on numbers 5, 7 and 9 had the widest range, but were still far better than most of the previous tests. Undoubtedly, poor contact existed between objects 7 and 9 and the cathode bar, the silver anodes (opposite objects 7 and 9) and the anode bar. This table suggests that it is possible to control silver plating to a high degree both of efficiency and within required limits of weight per given area.

As a further check the authors proceeded with still more tests with entire tank loads. Table IV, that follows, is a test on a tank load of dissimilar shaped and sized work. All the areas were determined as closely as possible by actual measurement. The pilot, as usual, was 3" x 6".

Table IV

Work No.	Description and Area in Sq. In.		Average Ampere Hours	Grams of Silver Deposited	Grams of Ag./Sq. Ft.	Eff. % Compared with Aver. Cur. Dens.
Pilot	"B"	36	0.45	1.7	6.8	95.0
1	Cocktail Shaker .	250	2.86	11.8	6.8	95.0
2	Water Pitcher ..	280	3.30	13.1	6.8	95.0
3	Coffee Urn	220	2.60	11.4	7.5	105.0
4	Loving Cup	220	2.60	13.3	8.7	112.0
5	Loving Cup	250	2.86	13.5	7.8	108.0
6	Gravy Bowl	50	.57	4.1	11.8	165.0
7	Dish Top	140	1.65	6.3	6.5	90.0
8	Round Tray ...	350	4.10	15.2	6.2	87.0
9	Rectangular Tray	500	5.90	17.8	5.1	71.0
10	Goblet	65	.77	3.6	8.0	105.0
11	Goblet	65	.77	3.4	7.5	112.0

Average Current Density = 1.7 amps./sq. ft.

Total Amperage at Tank = 27.5 amperes

Time Plated = One Hour

In analyzing the results of Table IV it is seen that the highest efficiency is 165% with respect to average current density, and the lowest is 71%—a range of 94%! This shows the wide difference in actual current density that may exist in a silver bath, at different points, and on different articles. Table IV also shows an interesting comparison of the amount of silver deposited per unit area on similar shaped articles in the same bath. For example, the small hollow items like the goblets and gravy bowl showed a high efficiency compared to the average current density, i. e. No. 6. Items 1, 2, 3, 4, 5, 10 and 11 showed comparable results, while objects of great area, e. g. Nos. 8 and 9 fall low in efficiency. Table IV proves that uniform results are very difficult to obtain when different shaped, and especially different sized articles, are plated at the same time.

A number of articles with varying deposits were taken and buffed to a bright finish with the usual rouge compounds. The amount of silver buffed off was determined by difference in weight on a large-beamed balance, sensitive to the second place in grams. The results follow:

Table V

Amount of Silver on Article	Amount of Silver Buffed Off	Percent Buffed Off
13.00	1.4	10.8
13.00	0.8	6.3
13.90	1.1	7.9
14.60	0.8	5.5
13.30	2.0	15.0
12.10	1.4	11.6
11.60	1.6	13.8
12.40	1.4	11.3
9.80	1.1	11.2
11.10	1.4	12.6
		1060.0 = 10.6% average

Conclusions

It has been proven that plating silver to specifications is practical. However, in order to obtain the best results the following conditions are necessary:

1—A balanced solution. The solution should be analyzed periodically and corrected to a standard.

2—Work must be distributed in tank as evenly as possible with respect to anodes.

3—It is necessary to have similar shaped and sized articles in tank at a given time.

4—Areas need not be taken. A pilot may be used to give a current density which can be corrected to the true current density. In order for the pilot to give an accurate reading with respect to the work it must be properly spaced according to work and depth of solution. Conditions similar to those shown in Table III must be maintained.

5—And last but most important is thorough cleanliness of all electrical connections at all times.

The authors wish to acknowledge and thank the Friedman Silver Company of Brooklyn, N. Y., for the splendid cooperation and assistance accorded them.

Precious Metals Chemists Talk About Assaying and Refining

ONE of the happiest gatherings during the recent convention of the American Chemical Society, in New York, April 22-27, was the luncheon of the Precious Metals Chemists, at which several problems of interest to the jeweler were discussed pro and con.

Two of America's leading workers on the platinum group metals, Dr. Edward Wichers and Dr. Raleigh Gilchrist, both of the National Bureau of Standards, presented papers* before the Society on the afternoon of April 25, 1935. Preceding this, some twenty-three chemists associated with the precious metals, lunched together at the Hotel Pennsylvania and discussed their common problems.

Among Those Present

Edward Wichers, National Bureau of Standards, Washington, D. C.
Raleigh Gilchrist, National Bureau of Standards, Washington, D. C.
B. G. Shields, U. S. Assay Office, New York City.
H. M. Nordell, Bart Laboratories, Belleville, N. J.
Fred E. Carter, Baker & Company, Newark, N. J.
Whitfield Smith, Baker & Company, Newark, N. J.
Ralph E. Fecht, Baker & Company, Newark, N. J.
Harvey Hugg, Tiffany & Company, Newark, N. J.
H. A. Huber, Export Consolidated Companies, 21 West St., New York City.
Marshall S. Walker, Walker & Whyte, Inc., 409 Pearl St., New York City.
John Jicha, Lucius Pitkin, Inc., 47 Fulton St., New York City.
Henry Ehrensperger, Lucius Pitkin, Inc., 47 Fulton St., New York City.
Thomas A. Wright, Lucius Pitkin, Inc., 47 Fulton St., New York City.
Theodore Merkt, Kastenhuber & Lehrfeld, 24 John St., New York City.
G. E. Woodward, Kastenhuber & Lehrfeld, 24 John St., New York City.
Clifford F. Kaiser, Kastenhuber & Lehrfeld, 24 John St., New York City.
Frank A. Meier, American Platinum Works, Newark.
J. S. Streicher, American Platinum Works, Newark.
William C. Bowden, Ledoux & Company, 155 Sixth Avenue, New York City.
R. E. Hickman, Irvington Smelting & Refining Works, Irvington, N. J.
R. Brenner, Sigmund Cohn, 44 Gold St., New York.
Sigmund Cohn, Sigmund Cohn, 44 Gold St., New York.
Calm M. Hoke (Miss), Jewelers Technical Advice Co., 22 Albany St., New York City.

What About Assay and Refining Losses?

One question, close to the heart of all manufacturing jewelers, was brought forth and aired at length. Mr. Wright, of Lucius Pitkin, phrased it about as follows: "There is a slight loss of precious metal in a fire assay of such materials as jewelers' floor sweeps, for example. There is also a loss in the refining of this material; now, which loss is greater—that in the assay or that in the refining?"

Several members took part in the ensuing discussion; these slight losses (which it is agreed are unavoidable) have sometimes caused more misunderstanding than their values justified. Mr. Wright and some others stated that in their opinion, with good assay practice and good refining practice, the losses are comparable—in approximately the same proportion in the two processes, and never unduly high. Others pointed out that since in refining a very large surface of molten metal is exposed to a blast of air, the possibility of greater loss at that stage of treatment is not surprising.

The Assay "By Difference"

Another subject discussed was the partial assay or so-called assay "by difference," in which for example platinum and iridium are reported together. It was explained that often a jeweler will have an accumulation of material such as floor sweeps, and will desire an assay reporting the exact percentage of every precious metal, but because of the small value of the entire accumulation he can afford only a partial assay. To the ethical assayer, the idea of partial or approximate assays is anathema; it violates his sense of justice. However, there are times when an approximation, which can be obtained in a fraction of the time and at a fraction of the cost of a complete assay, is valuable to a jeweler. It was agreed that this partial assay had its function, and that if its nature and limitations were clearly stated on the assayer's report, it should not be considered in any way unethical.

The luncheon was called together by Miss C. M. Hoke of the Jewelers Technical Advice Company; Mr. Sigmund Cohn, dean of bullion dealers, sat at the head of the table and introduced the various attendants to our Washington guests and to each other.

* Abstracts of these papers will appear in an early issue.

The Anodic Coating of Aluminum

By Dr. HAROLD K. WORK
Aluminum Company of America

A Review of the Process. Solutions, Operating Practice and Commercial Applications*

THE anodic treatment of aluminum has spread rapidly in the past few years until now it is one of the important branches of the electrolytic coating of metals. In this country alone several millions of pounds of aluminum are being anodically treated annually.

Principles of Anodic Coating

The process differs from electroplating. One difference is that from which it derives its name; the articles to be treated are attached electrically as anode rather than cathode. In electroplating, a metal is deposited on the article being coated; in anodic treatment, in effect, oxygen is deposited instead of the metal and combines with the aluminum to form aluminum oxide. Another distinction is that this oxide, after it is formed, does not dissolve on mere reversing the direction of the current flow, as is the case with most electroplates. Due to this characteristic it is possible, although rather inefficient electrically, to apply anodic coatings by alternating current. The articles to be coated may be suspended in the electrolyte from both of two rods which are connected to a transformer, giving the proper voltage. When the current flows in one direction the work on one rod is coated, but when it flows in the opposite direction the work on the other rod receives the coating. Alternating current actually has been used to a limited extent for commercial work, but experience has indicated that it requires a greater amount of electrical energy to obtain a given abrasion resistance.

Types of Solutions

While the process of applying relatively thick anodic coatings to aluminum has not found extended commercial application until recently, thin oxide coatings with important electrical properties have been used in electrolytic rectifiers and condensers for many years. These, however, are so thin and lacking in other properties that they have been used only for such special application. Newer processes, which allow the formation of thicker and more durable coatings, have been developed. Flick[1] found that a dense adherent coating of oxide could be applied to aluminum by making it anode in a solution of ammonium hydroxide or ammonium sulphide. With the former electrolyte the coating is white; with the latter it is pearl gray. At a potential of 220 volts a coating forms in less than a minute. The coating may be employed for its decorative, protective, or insulating properties. Bengough and Stuart[2] in England employ a 3 per cent chromic acid electrolyte to form a gray corrosion-resistant oxide coating on aluminum. This process has been quite widely used but since the coating is still fairly thin it has been customary to employ it primarily as a base for paint. Such a finishing system of oxide coating and paint gives very desirable protection to thin sections of certain alloys in aircraft work. The voltage required to produce coatings in chromic acid is fairly high—forty to fifty volts—following a carefully defined schedule for one hour, so the process is relatively expensive. Recently chromic acid processes, employing higher acid concentrations, have been developed, which are somewhat simpler. Another electrolyte which also requires high voltages is oxalic acid[3, 4]. Sometimes, as in Germany[5], a small amount of chromic acid is added to the oxalic acid. The chromic acid reacts with the oxalic acid, giving off gas, and the solution assumes a purple color, probably due to the formation of chromium oxalate.

In the United States the most widely used electrolyte is sulphuric acid, as exemplified by the Alumilite process. Hard white coatings may be applied from sulphuric acid and only low voltages are required for their application. The characteristics of the coating may be varied widely by selection of the proper concentration of sulphuric acid. Tosterud[6] had applied hard, highly abrasion resistant anodic coatings in an electrolyte of about 7% sulphuric acid. Gower[7] using 25% acid secures both good abrasion resistance and good color adsorption. Bengston[8] by using 65% sulphuric acid obtained coatings which dye very readily and which may be easily formed without harming the appearance of the coating. Quite recently mixtures of oxalic and sulphuric acids[9] have been employed to secure, at higher electrolyte temperatures, the hardness of the sulphuric acid coatings along with the white color (where commercially pure metal is treated) and the low operating voltage of sulphuric acid.

Precautions Necessary

The application of the oxide coating requires certain special precautions. The solutions require exhaust systems to remove fumes; otherwise the spray of sulphuric acid will become very irritating. Also, the racks must make firm contact with the article being coated. If this is not done the contact between the work and the rack will break, due to the formation of an oxide coating between them, and the article will cease coating. The racks in the submerged portions are of aluminum; other materials for the most part would allow passage of excessive current from the racks and might dissolve

* From The Monthly Review of the American Electro-Platers' Society, April, 1935. All other footnote references at end of article.

rapidly. While agitation of the electrolyte in electroplating is usually harmful because it keeps particles in suspension which settle upon and roughen the finish, in anodic coating, it has been shown by Bengston[10] that agitation is highly desirable, for it helps maintain an even temperature at the surface of the work. In contrast to most plating solutions the anodic coating solutions as a rule have very good throwing power. Auxiliary cathodes are only infrequently necessary.

The anodic treatment of small articles in quantity is quite different from electroplating such parts. This is because a firm contact must be made and maintained at one point, for it is not possible to keep changing the point of contact because of the insulating nature of the coating. The coating of such small objects is, therefore, accomplished by means of a perforated container with a screw top, which makes a firm electrical contact between the individual pieces and the rack. These constitute the more obvious differences between electroplating and anodic treatment.

Properties of the Coating

The properties of the anodic coatings are particularly interesting. One of the outstanding and most valuable characteristics of the anodic coating is its high abrasion resistance. It is this property, among others, which has made the coating so useful on cafeteria trays, electric refrigerator trays, and automobile pistons. The corundum-like hardness of the coatings applied under suitable conditions may be readily observed by scratching the surface with a pointed instrument. This characteristic of the coating has been studied by revolving the coating against an Aloxite wheel under a light constant pressure and observing the number of revolutions required to cut through the coating. A few typical figures showing the abrasion resistance of the coating follow:

Relation Between Abrasion Resistance and Thickness of Oxide Coatings

Thickness of Coatings Inches	Abrasion Resistance in Revolutions
0.00011	15
0.00019	95
0.00031	268
0.00037	365
0.00074	2563
0.00148	7061

For comparison, a finish of the durable type such as is applied to metal furniture consisting of primer, two ground coats, graining coat, and three coats of finishing varnish, having an overall thickess of 3 mils, gave an abrasion resistance of 306 revolutions and a somewhat different finish of the same thickness gave 1,095 revolutions. Thickness for thickness, therefore, the oxide coating is much more wear resistant than the paint films just mentioned. Of course, as would be expected, the coating conditions, and the composition and temper of the alloy being coated all affect to a greater or less extent the hardness of the coating.

The adsorptive properties of the coating were discovered by Flick[1]. He found that certain organic dyes could be readily adsorbed in the oxide coating. The color penetrates throughout the coating giving deep colors which, however, have an underlying metallic sheen which makes them unique and particularly attractive. It is of course recognized that the organic dyes, as in the case of dyed fabrics, will eventually fade on continued exposure to the weather. Tosterud[11] has shown that where greater light fastness is needed, mineral pigments such as metal oxides may be precipitated in the coating. These mineral pigment colors are restricted to somewhat less brilliant colors than the dyes. Such finishes, when properly applied, have maintained their original color for several years of exposure to the weather but the ultimate life of the coatings is not yet known.

The fact that the coatings adsorb materials so readily is not always advantageous. For certain types of service, such as on cafeteria trays, it is essential that food products coming in contact with the coating by accident should not stain it. Bengston[12] discovered that treatment with boiling water will effectively "seal" the coatings and prevent them from staining or dyeing. Such a treatment, as is shown by X-ray examination, changes the amorphous alumina originally formed, in part at least, to crystalline alpha-monohydrate. Accompanying the change in the crystal structure is a marked increase in the corrosion resistance of the coating. Edwards[13] has shown that it is possible to further increase the corrosion resistance of the coatings by adsorbing substances such as silicates or chromates in them. For example a group of aluminum alloy specimens were oxide coated electro-chemically in a sulphuric acid electrolyte and part of the group was treated with a soluble chromate. After 52 weeks in a 20 per cent salt spray the specimens with the chromate treated coatings lost only 4.5 per cent on the average of their elongation, while those without this treatment lost on the average 16 per cent.

The oxide coating in dry form is an excellent electrical insulator. The break-down voltage of the film is roughly proportional to the thickness of the coating. A few typical figures for coatings on commercially pure metal follow:

Break-down Voltage of Coating

Thickness of Coating Inches	Breakdown Voltage
0.0002	180
0.0004	280
0.0006	340
0.0008	380
0.0010	420

These values may be increased by as much as fifty per cent without the introduction of any organic matter in the coating by use of a "sealing" treatment mentioned above.

One characteristic of the coating which has not been mentioned is its adhesion. In electroplating special precautions must be taken to ensure adhesion of the coating; in anodic coating there has been no such problem for the bond between the aluminum and the coating seems to be every bit as strong as the coating itself. Since the coating is formed from the aluminum, grease or dirt on the metal surface may prevent formation of the film in local areas but it will not affect the adhesion of such coating as is formed.

Commercial Applications

It is of interest to consider briefly a few of the many commercial applications of the finish. Perhaps the largest single application is in trays and related parts for electric refrigerators. Another field which will in all probability surpass it is the use of Alumilited aluminum for architectural work. Store fronts, spandrels, and escalators in department stores are a few examples where the hard, corrosion-resistant finish is finding rapidly increasing application. Cafeteria trays are being coated to prevent them from

smudging white articles with which they come in contact. Automobile pistons and trim are being coated in increasing amounts. In addition a host of miscellaneous novelties are being attractively finished in Alumilite colors. The steadily increasing use of this finish indicates that it is going to occupy a prominent place in the field of electrolytic finishes.

[1] Flick, U. S. Patent 1,526,127 (Feb. 10, 1925).
[2] Bengough & Stuart, U. S. Patent 1,771,910 (July 29, 1930).
[3] Kujirai & Ueki, U. S. Patent 1,735,286 (Nov. 12, 1929).
[4] Work, U. S. Patent 1,965,684 (July 10, 1934).
[5] Schmitt, Hauszeitschrift d. V. A. W. u. d. Erftwerk A. G. fur Aluminum 4, 79 (April, June, 1932)
[6] Tosterud, U. S. Patent 1,900,472 (March 7, 1933).
[7] Gower, U. S. Patent 1,869,058 (July 26, 1932).
[8] Bengston, U. S. Patent 1,869,041-2 (July 26, 1932).
[9] Work, U. S. Patent 1,965,682 (July 10, 1934).
[10] Bengston, U. S. Patent 1,891,703 (Dec. 20, 1932).
[11] Tosterud, U. S. Patent 1,965,269 (July 3, 1934).
[12] Bengston, U. S. Patent 1,946,147 (Feb. 6, 1934).
[13] Edwards, U. S. Patent 1,946,151-3 (Feb. 6, 1934).

Selected Bibliography

Edwards, Tosterud, and Work, Electrical Engineering, June (1932).
Edwards, J. D., Ind. Eng. Chem., News Ed. 11, 328 (1933).
Bengston and Pettit, Am. Machinist 77, 76-9 (1933).
Mantell, C L., Metal Cleaning & Finishing 6, 11 (1934).

Setting Up Steel Disc Wheels

Q.—I WOULD like to have some information on setting up used discs in No. 16 and No. 36 emery like that used on auto fenders and bodies.

A.—Setting up discs successfully is a test of good and careful workmanship. In the first place the steel disc must be made clean and absolutely free from old cement or glue, oil or dust. Remove any rough or coarse material with a broad flat scraper, and wash with hot lye water. After the disc is made perfectly clean and dry, thoroughly scrub the surface with half-and-half solution of water and cement. Wipe off dry with a clean lintless cloth. After scrubbing keep the disc free from air dust or any contact with liquids or your hands.

Place the clean disc on the press and give a light coat of cement, which may be poured from the can and spread with a flat soft brush. Be sure that the entire area is equally covered, for any shrinkage spots, bubbles or streaks will not unite with the abrasive disc. The liquid cement is intended to be used cold, which means at the ordinary room temperature. Glue is used hot (but that is another story). Apply a heavy coat of cement to the back of the abrasive disc, and brush thoroughly until no more will be soaked up. This heavy coating of the abrasive disc is very important, for any spots not completely filled with cement will not likely stick to the steel disc. Place the coated surface of the abrasive disc on the steel disc freshly prepared, starting at one edge and coming in contact with the area gradually so as to prevent enclosing any air pockets. Lay on a one-fourth inch felt pad to act as a cushion, so as to apply the pressure evenly all over the disc. Clamp down the press as tightly as possible, and tighten the press further after the work has settled from the first squeeze. The disc should remain in the press from 24 to 48 hours. The drier the weather or room the shorter the time in the press. Trim off any projections around the edge, using a coarse file or rasp. Keep the work in a warm dry room in a free circulation of air until needed. Be careful to clean off the face of the wheel and the spindle collar before mounting them together.

If waterproof grain cement is used to set up the abrasive disc, heat the steel disc to soften the old cement so as to take off the old disc. Scrape off clean. Sprinkle the powdered cement on the cold steel disc, and heat evenly until the cement starts to melt, and spread it with a flat steel paddle. Enough cement should be used to form a heavy coat. Do not overheat to cause bubbles in the cement. Place the clean abrasive disc on the coated steel disc, put on the felt pad and clamp in the press for about fifteen minutes.—**Mechanical Engineer.**

Silver From Iodide Solutions*

By C. W. Fleetwood and L. F. Yntema

Many attempts have been made to find a substitute for the cyanide bath for the deposition of silver. A non-poisonous bath would be welcomed by the industry. Numerous attempts have been made, and references to them are given, the various baths including many silver complexes and various silver salts, with or without addition agents, in aqueous and non-aqueous solvents but not one of these attempts gave satisfactory results.

In the present attempt, further solutions were investigated, and it was found that a **sodium iodide-citrate bath satisfies the requirements** of a good plating solution in character of deposit, permanency of the bath, ease of preparation, anode corrosion and cathode efficiency. Details of preparation, tests made, range of concentrations employed, and a list of literature on previous attempts, are included. C. W. Fleetwood and L. F. Yntema, St. Louis University. **Abstract by C. M. Hoke.**

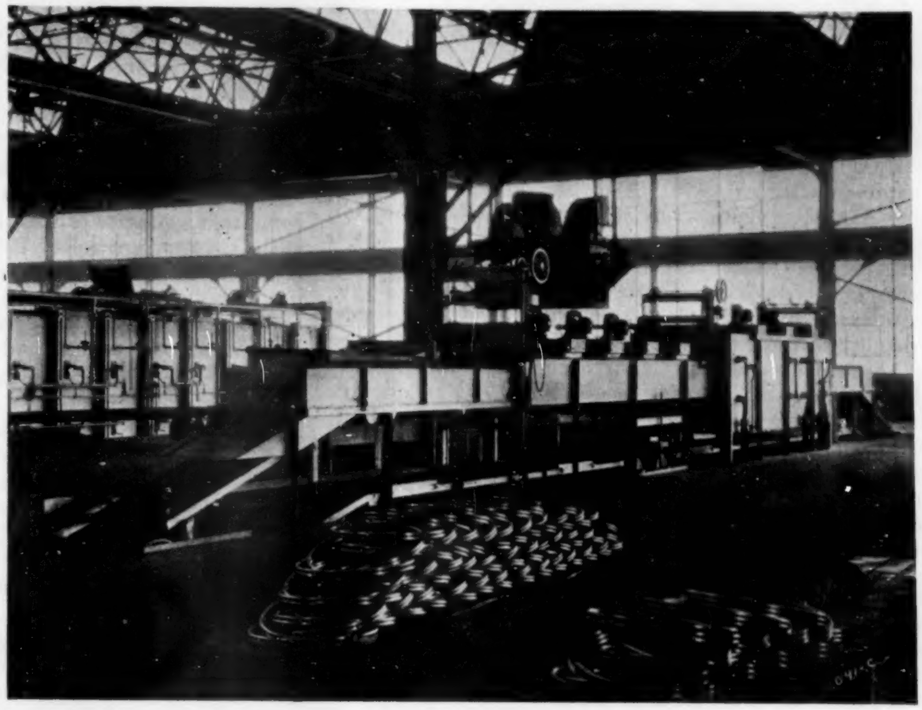
* Reported in full in **Industrial and Engineering Chemistry, 27**, 3, March 1935, p. 340.

Triflex Rubber Lined Stack

Photograph taken at the Naval Gun Factory, United States Navy Yard, Washington, D. C., showing a ventilating stack erected to remove fumes from the plating shop. This stack is lined with Triflex, made by the B. F. Goodrich Rubber Company, Akron, Ohio. Stack dimensions: 32" diameter, 100 ft. high. Flanged sections are bolted together. Note the icicles on the building in the exterior views of this installation. Contraction and expansion are therefore a problem which has been successfully met.

Electric Bright Annealing

THE plant of the Chase Brass and Copper Company, in Cleveland, has installed a continuous, controlled atmosphere electric furnace for bright annealing copper tubing, which was constructed by the Electric Furnace Company of Salem, Ohio. This carries the tubing through the furnace with the speeds regulated to suit the different kinds of material and the degree of anneal desired. The tubing emerges from the furnace, bright annealed, ready for inspection, packing and shipment.



Bright Annealing Coils of Tubing at the Plant of the Chase Brass and Copper Company, Cleveland, Ohio

furnace has an over-all length of 97 feet and an over-all height of 7½ feet. In width it is graduated, being six feet at its widest point. The heating chamber is 18 feet long and the cooling chamber and hoods occupy the remainder of the space.

The furnace has at the head a charging compartment especially designed to prevent the escape of heat and the artificial atmosphere. The heating compartment is a chamber with insulated walls on which are mounted electric heating elements which have maximum radiation surface. There are two heat zones and a range of from 1000 to 1200 degrees F. The cooling chamber is double-walled, being cooled by water circulating between the walls. It is here that the tubes are cooled sufficiently to prevent discoloration when they come in contact with the open air. The discharge hood is the same as the charging hood in that it is designed to prevent the escape of heat and the artificial atmosphere, which is generated in the heating and cooling chamber by partially cracking natural gas. This cracking process consists of partial combustion of the gas in a closed chamber containing a controlled supply of oxygen. The combustion is started by electric heating elements and continues automatically. The artificial atmosphere, after proper cooling, is pumped into the heating and cooling chambers at the requisite pressure and kept in a state of constant agitation.

A motor-driven, continuous mesh-metal conveyor

The principal advantages for this type of furnace are: (1) accurate control of temperature; (2) automatic regulation and operation; (3) saving of labor, reduced time of operations and consequent improved production at reduced expense.

Gold on Stainless Steel

Q.—Enclosed please find sample of stainless steel (stern iron) links. I would like to electroplate these links with a green gold, 16 K. gold or English finish. If this can be done, I would appreciate some formula to plate these satisfactorily.

I have tried to plate them in a cyanide copper solution, a 16 K. gold solution and a nickel solution, but the coating peels off and can be rubbed off.

A.—To obtain any durable finish it would be well to copper flash, brass plate, and then gold plate. The steel should be buffed to a good finish, cleaned in alkali with a reverse current, rinsed in water, made the anode for about 2 minutes in a 5% hydrochloric acid solution, rinsed in water and put into a warm cyanide copper solution for from 3 to 5 minutes, 10 amperes per sq. ft.; again rinsed and plated in a brass solution, or preferably a bronze solution. (See Blum & Hogaboom, page 386). The time of plating should not be less than 20 minutes or better still, 30. Rinse and dry, buff to color; clean and gold plate.—**E. E.**

EDITORIALS

Business Progress

IMPROVEMENT in business conditions was shown in March, and the first half of April, according to the regular business survey of the National Industrial Board. This was caused by the continued expansion of the automobile industry and the sharp rise in building activity. Residential building contracts in March advanced 93.8% over February and were 14.7% higher than in March, 1934. Machine tool orders rose sharply from the low levels of February. Unemployment decreased by 1.3% from February. An individual case, large enough, however, to be considered seriously, is the General Electric Company which reported sales billed for the first quarter of 1935 amounting to over $40,000,000 compared with less than $35,000,000 in the same quarter of 1934. Also the New York Stock Market has been rising consistently since about March 15th.

This picture, however, is colored by a few dark streaks. The New York Times Weekly Index of Business Activity showed a declining trend in April. Textile production receded by more than the usual seasonal amount, as did also department store sales. Unemployment is still at high levels, 9,760,000 according to the National Conference Board, 366,000 more than in March, 1934.

Part of this mixed condition is due to the fact that business has been decidedly spotty in character. The Middle West has been busy, fed by the automobile industry. New England has done very well, possibly aided to a certain extent by the same factor. The Metropolitan District has been decidedly slow, suffering a very poor quarter.

A broad opinion must be more of a guess than anything else, due to the above mentioned spottiness. Such a guess would probably have to be that conditions are on the whole no worse than they have been, perhaps a little better, but certainly not much so.

Balancing the Budget

THE daily press headlines recently featured the new British budget which showed a surplus for the past fiscal year and the consequent reduction in taxes for the coming year. There is a natural tendency for us to say that we wish our Government would do as much for us—give us a balanced budget and a reduction in taxes.

There is another side to the medal, however. In Great Britain, a single person with an income of about $2,400 a year will pay $229 in income taxes against about $90 (Federal plus State) in the United States. A married couple with two children on the same income will pay $47.00 in England and nothing in the United States. A married couple with two children and an income of $4,850 will pay $480 in England, and a total of about $90 in the United States.

The National Industrial Conference Board states the case briefly, when it points out that an average increase of 100% of all Federal rates or an average rate of 140% for restricted groups of taxes would be necessary to balance our budget.

There is also the fact to be considered that Great Britain's expenditures for 1935 were 97% of their outlay in 1929. During the same period America's expenditures rose to 223% of the 1929 figure.

What is the Higher Need?

THE United States Treasury has been buying silver from domestic and foreign sources for more than eight months. During that time it has acquired 300,000,000 ounces in its effort to make the ratio of monetary gold to silver, 3 to 1. According to unofficial figures, it is almost as far from its object as it was at the beginning of the campaign due to the concurrent increase in gold stocks. In the meantime, the Treasury prices of silver has now reached 77.57.

It has become the policy of the Treasury to say nothing about its plans. To a certain extent this is understandable because of the fact that it is competing in the open market for silver with international speculators. In the meantime, however, users and consumers of silver are trapped. They dare not make long term contracts for the metal as they risk a possible reversal of policy by the Treasury, which would result in huge inventory losses. They must, however, have metal to work with. In many cases the prices for their products have been set and they cannot get increases to cover the additional cost of silver.

Presumably the Administration has an objective—to improve our monetary system, providing a broader base to allow for more currency. We are faced with the fact, however, that our present base allows for very much more currency than we have ever used in our history; that there is no shortage of currency at this time, but rather a huge unused reserve of metal; that currency is no longer the most important factor in our business life, as transfers of funds are effected almost entirely by check.

What is then the "higher need" which makes it necessary to dislocate an industry; to throw a friendly nation's finances into the chaotic condition and to create doubt and fear in the minds of the vast majority of business and banking institutions?

Is it the senatorial votes controlled by the silver-producing states?

Appeal to Non-Ferrous Foundrymen

ONE of the many questions now confronting the brass, bronze and aluminum foundry industry along with others, is the future of organization in the industry. Since the status of the N. R. A. is in doubt, and to a considerable extent the future of every code authority is in the hands of the members of Congress, the foundrymen have been asked to state their opinions based upon their experience. Code Authority Circular No. 23 of the Non-Ferrous Foundry Industry puts the problem clearly and frankly.

What has been accomplished? First of all cut-throat competition by means of cut-throat wages has been largely eliminated. A campaign of education of foundrymen has been instituted, consisting of the preparation and distribution of a uniform cost estimating and accounting system, a standard estimating form, a set of standard trade customs, a standard sales proposal form, and a classification of miscellaneous castings as to weight and intricacy. Statistics as to wages, hours, production and sales are being kept up and distributed. The industry has co-operated with others in heading off the cut of 10% in hours per week with a corresponding increase in wage rates

as well as the passage of the 30-hour maximum work-week. And last but far from least, 263 complaints of code violations have been investigated and adjusted.

Plans for the future consist of the elimination, by vigorous investigation of all complaints, of as much as possible of the cut-throat competition which is still harassing the industry; carrying on the statistical work to keep foundrymen informed as to whether they are in step with the existing trends; gradual education of purchasers about proper method of obtaining bids based on sound estimates and not on guesses; continuance of the work on cost information regarding the various classes of castings; continuance of co-operative effort to combat legislation adverse to the industry.

The Code Authority of the Non-Ferrous Foundry Industry asks for opinions and recommendations from foundrymen. Do they want the N. R. A. extended, modified or scrapped? Has it benefitted them? Can it be made to benefit them more? Would they be better off without it? Would they prefer to go back to the days of unrestricted competition without co-operation of any sort between foundrymen?

It is an honest request for foundrymen to give their honest opinions.

The Platers' Convention Program

THE activity of the Convention Committee of the American Electro-Platers' Society is evidenced by the fact that their program is ready weeks ahead of the Convention to be held June 10-13 in Bridgeport, Conn. A full list of papers can be found on page 182 of this issue.

However, it is not only the Committee's forehandedness which is praiseworthy, but also the character of its work. The American Electro-Platers' Society not only makes prompt deliveries, but offers the highest quality of product! The authors are representatives of some of the largest manufacturers in the United States. They are men in responsible charge of work in the laboratory and plant. They are technical men as well as practical, but all with a keen understanding of the practical aspects of plating operations—the absolute necessity of producing the highest types of finishes at minimum costs.

As to the subjects of their papers—what could be more timely and practical than such questions as spotting out, metal coloring, black nickel, plating die castings and barrel burnishing? What is more fundamental in character than the adhesion of deposits, the effects of different acids on cold rolled steel, spectrographic analysis, x-ray examination, the measurement of the thickness of deposits and the prevention of season cracking in solutions? In addition, the program also includes a discussion of accelerated corrosion tests and reports of progress of the researches at the National Bureau of Standards.

Attendance at the Annual Convention of the American Electro-Platers' Society has always been a paying investment. This year, with the industry moving forward so fast, it will be more than important. It will be essential.

Discoveries—New and Old

THE plating industry has risen to a new dignity. It is now in the class with the alloy industry in that it is subject to new "developments" and "discoveries." Just as we have always had our regular quota of hardened copper inventors, we are now beginning to have new plating solution inventors.

A recent instance is a report from an English firm working with the problem of depositing brass, which found that additions of arsenic brighten the plate. To the normal solution which contained sodium cyanide, copper cyanide, zinc cyanide and soda ash, was added a solution containing caustic soda, and some white arsenic and ammonia.

We are ready to believe that some results were obtained, especially in view of the fact that the following information was printed in our Platers' Guidebook, 1930 edition, page 9.

"When arsenic is added to a brass solution to produce a bright deposit, care should be used to avoid excess as a light colored deposit will be the result. To prepare the arsenic stock solution, take two pounds of caustic soda and dissolve in 2 quarts of cold water. Then add 1 pound of white arsenic and when all has been dissolved, dilute to 1 gallon. One ounce of this stock solution is enough to add to each 100 gallons of solution."

Bring on the next "discovery"!

Profitable Patents

THE lure of invention has never failed. We owe to this lure a large part of the amazingly rapid industrial development which it has been our good fortune to experience in the last three-quarters of a century. The Patent Office has registered No. 2,000,000.

At the same time it has become generally recognized that a very small percentage of the patents granted accomplished very much in bringing financial rewards to their inventors. To some extent, it may be due to the fact that inventors are impractical men who do not know how to handle their property. To a great extent also, it is due to the fact that an invention may be too far ahead of its time.

A recent communication from Investors Foundation, Inc., points out that a patent for a streamlined train was granted as far back as 1865, and that the inventor never profited. The railroads could not use the invention as they had neither the Diesel engine nor light weight metals. The most profitable inventions since the establishment of the U. S. patent system in 1790, have been for articles which have met an existing need in a better way. Witness, for example, safety razor blades and even the old safety pins. The ambitious but inexperienced inventor may aim for basic inventions in a class with the airplane, the telephone and the automobile, which rarely bring great fortunes to their inventors, overlooking the fact that the collar button with a turn down clip earned about $3,000,000, the peg golf tee $3,000,000, and the metal cap for beverage bottles earns $1,000,000 a year.

One of the primary tests of the practicability of an invention, from a financial standpoint, is whether or not industry is ready for it.

Correspondence and Discussion

Reminiscences of a Plater's Kid

To the Editor of **Metal Industry:**

I do not agree with George Hogaboom that plating reminiscences make good reading. They are sorrowful and should stay buried; those memories of the long ago when at times we even plated with batteries, when voltmeters and ammeters were unknown, and we didn't know what a watt was.

However, there were occasional bright spots, and later on when our Platers Society was formed, St. Louis could truthfully lay claim to the pioneer low pH Plater. My dear friend, George Lamkemeyer, for many years the foreman plater at the Majestic Range Company was the man. George has passed to the Great Beyond, but his memory remains with us. His insistence on his Solution maintenance methods earned him the title of "Sulphuric Acid George" and gained him recognition as follows:

There is a Plater in our Branch, and he is wise and slick,
He uses Oil of Vitriol when a Nickel Solution's sick,
And just how he gets by with it nobody really knows,
He claims Sulphuric Acid cures all Platers' plating woes.
They say he eats it on his bread and rubs it on his shoes,
He sprinkles it upon his clothes and pours it in his booze.
He cleans with it the window panes and when he scrubs
the floor,
George uses nothing on his mop but H_2SO_4.

But why reminisce over the obsolete past? Why not rather rhapsodize over the glorious present? In fact, if I may be allowed to poetize on the plating progress and the scientific trend of our present-day Platers, may I offer the following:

We're American Platers, scientific debaters,
We know everything about plating.
Of course we'll confess there are times when we guess,
But so seldom it's not worth relating!

We speak in equations of plating relations,
And Chemical dope is just pie.
We measure in metric, know all about 'lectric,
Ohms laws we'll obey till we die.

In every way we get better each day,
How clever we are we won't tell.
Before many moons come, we will teach Dr. Blum
For we'll be scientific as hxll!

St. Louis, Mo. **HEDLEY J. RICHARDS.**
Lasalco, Inc.

"Yours for Service"

To the Editor of **Metal Industry:**

I am certainly more than pleased to be a subscriber and I have been for some time

Yours for the same good **Metal Industry** Service.

Hamilton, O. **C. W. GARRETT**
Foreman Plater

Book Notes

A Manual of Foundry Practice, by J. Laing and R. T. Rolfe. Price $5.50. Sherwood Press, Box 2617, Lakewood Branch, Cleveland, Ohio.

The Hardness of Metals and Its Measurement, by Hugh O'Neil. Price $8.00. Sherwood Press, Box 2617, Lakewood Branch, Cleveland, Ohio.

Publications of the American Society for Testing Materials, 260 South Broad Street, Philadelphia Pa.

- 1934 Supplement to Book of A. S. T. M. Standards. Standards on Coal and Coke. Price $1.
- List of A. S. T. M. Standards and Tentative Standards. Price 25 cents.
- Symposium on the Outdoor Weathering of Metals and Metallic Coatings. Price $1.25-$1.50.
- Service Characteristics of the Light Metals and Their Alloys. Price 50 cents.
- Book of A. S. T. M. Tentative Standards. Price $7.00-$8.00 depending upon binding.

Minerals Year Book for 1934. Published by the National Bureau of Mines. For sale by the Superintendent of Documents, Washington, D. C. Price $1.75.

Statistical Appendix to Minerals Yearbook 1932-1933. National Bureau of Mines. For sale by the Superintendent of Documents. Price $1.00.

Budgeting, by Prior Sinclair. Published by the Ronald Press Company, 15 E. 26th Street, New York City. Size 6 x 8½; 438 pages. Price $5.00. Estimating and constructing budgets systematically; revising the budgets and managing of the budgets.

Handbook of Chemistry, by N. A. Lange. Published by Handbook Publishers, Inc., Sandusky, Ohio. Size 5 x 8; 248 pages. Price $6.00. A reference volume of chemical and physical data used in laboratory work and manufacturing. For chemists, physicists, mineralogists, engineers, manufacturers, etc.

The Law of Patents for Chemists, by Joseph Rossman. Size 5 x 8; 378 pages. Price $4.50. This is the second edition of a book reviewed in our issue of April, 1932, page 160.

Alloys of Iron and Copper, by Gregg and Daniloff. Size 6 x 9; 454 pages. Price $5.00. Published by McGraw-Hill Book Company, 330 W. 42nd Street, New York City. One of the volumes in the Alloys of Iron Research under the auspices of the Iron Alloys Committee of the Engineering Foundation.

Chemical Engineering Catalog, 19th Annual Edition, 1934. Size 8 x 11; 779 pages. Published by the Reinhold Publishing Corporation, 330 W. 42nd Street, New York City. A collected, condensed and standardized catalog of data on equipment, machinery, laboratory supplies, heavy and fine chemicals, and raw materials used in the industries employing chemical processes of manufacture.

Technical Publications

The Creep and Fracture of Lead and Lead Alloys, by H. F. Moore, B. B. Betty and C. W. Dollins. Published by the Engineering Experiment Station, University of Illinois, Urbana, Ill. Price 50c.

Proposed American Standard for Plumbing Traps, published by the American Society of Mechanical Engineers, 29 W. 39th St., New York. Copies obtainable from C. B. Le Page, Assistant Secretary.

Heavy Duty Anti-Friction Bearings. A report of a three-year experimental program, published by the American Society of Mechanical Engineers, 29 W. 39th St., New York. Price $1.50.

Government Publications

Lead Industry in 1934—Advance Summary. U. S. Bureau of Mines, Washington, D. C.

Cadmium Industry in 1934—Advance Summary. U. S. Bureau of Mines, Washington, D. C.

Magnesium Industry in 1934.—Advance Summary. U. S. Bureau of Mines, Washington, D. C.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical Electroplating, Polishing, and Metal Finishing

H. M. ST. JOHN	W. J. PETTIS	O. J. SIZELOVE
W. J. REARDON	W. B. FRANCIS	WALTER FRAINE

Dark Nickel

Q.—There are 3 anode rods in my tank and I am using 125 anodes which might run on an average of 70%. Would you advise me on anode surface; also best conducting salts to use.

Is there any method preventing crystallizing of metal in solution other than heating. The room is very cold on account of the blower system. Therefore, anodes cover very quickly with metal. Am also sending sample of work. Cannot just determine original formula of solution. When dark deposits started I tried ½ oz. table salt to gallon of solution. That did not make condition any better, so I added 100 lbs. single salts; that improved it some but does not produce color required.

A.—Analysis of nickel solution:

Metallic nickel	4.31 ozs.
Chlorides	3.05 ozs.
pH	5.2

The metal and chloride contents are satisfactory, but the pH is too low.

Would suggest that you add 160 fluid ozs. of 26° ammonia to the solution to correct the pH to 6.0.

Applying heat to the solution by using steam and lead coils is recommended to prevent crystallization of the nickel salts.

Problem 5,381.

Copper on White Metal

Q.—I would like to ask you a few questions with reference to the depositing of copper on white metal. I want to deposit a plate of copper a quarter of an inch thick on white metal which is four by two-and-a-half inches large, modelled and brightly engraved using the electro-metal-depositing process.

1. How can I remove the white metal from the copper without injuring the copper in any way? What process can I use or what provisions should I make beforehand to make the copper removable?

2. Will this copper stand the heat of 400° C.?

A.—To deposit copper a quarter of an inch in thickness an acid copper solution is recommended to be used.

The deposited copper can be heated to 400° C. An oxide of copper will be formed at this temperature which can be removed by using a hot sulfuric acid pickle.

The soft metal, the sample which you have submitted is know as Britannia metal, will melt below 400° C. and the copper can be separated by this heating process.

Problem 5,382.

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all items if possible.

Date............................

Name and address: .... **Employed by:** ....

Kind of solution: .... **Volume used:** ....

Tank length: .... **width:** .... **Solution depth:** ....

Anode surface, sq. ft.: .... **Cathode surface, sq. ft:** ....

Distance between anode and cathode: .... **Kind of anodes:** ....

Class of work being plated: .... **Original formula of solution:** ....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible.

Use separate sheet if necessary. ________________________________

____

____

____

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY. 116 John Street. New York City.

Nickel Analyses

Q.—I am sending you samples of two nickel solutions. Please check them for me.

A.—Analysis of nickel solutions:

	Metallic nickel ozs.	Chloride ozs.	pH
1—	2.86	4.26	5.4
2—	2.52	5.62	5.6

The metal content of No. 2 solution is somewhat low, the chloride content of both solutions too high and so is the pH.

We would suggest that you add 100 lbs. of single nickel salts and 12 fluid ozs. of 26° ammonia to No. 1 tank. Add 4 fluid ozs. of 26° ammonia to No. 2 tank. Do not add any more chlorides to either solution for some time to come.

Problem 5,383.

Operating Brass and Copper Solutions

Q.—Under separate cover we are sending you sample of each of our brass and copper solutions.

We shall appreciate it if you will analyze both of these solutions and let us know just what they lack and what we should do to bring them up to standard.

We have been operating the brass solution cold and the copper, warm. Do you thing we will get better results if we operate the brass solution warm also?

At present the brass anodes in the copper solution seem to be collecting an immense amount of whitish gray substance. Will you please let us know what is causing this?

Can you give us any suggestions for brass plating white metal? Would you advise a copper flash before putting the piece into the brass solution?

A.—Analysis of brass solution:

Metallic copper	5.82 ozs.
Metallic zinc	.95 oz.
Free cyanide	5.77 ozs.

The constituents of this solution are all too high for best operating conditions. We would suggest that the volume of solution be reduced one-half and then replenished with water. Then operate solution at 80° F. and if the color of the deposit is too red, add a small quantity of 26° ammonia to the solution.

Analysis of copper solution:

Metallic copper	5.56 ozs.
Free cyanide	1.17 ozs.

This solution is too concentrated so would suggest that the volume of the solution be reduced one-half and then replenished with water. Operate at 110 to 120° F.

Brass anodes are not recommended to be used in a cyanide copper solution. A copper flash can be used to good advantage before brass plating white metal.—Problem 5,384.

Pitted and Thin Nickel

Q.—I am sending two samples of nickel solution. We have had considerable trouble of pitting. Part of the tank will pit and part of it will not. We cannot use over two volts. Work starts to show light spots and the plating is very slow.

The plating of all steel work is prepared as follows: polish, 180 grease; wash in mineral spirits; put in hot alkaline cleaner with electric current; rinse; dip in muriatic; rinse; scrub with pumice; rinse; dip in cyanide solution; rinse; put in copper tank for about 1 minute, then rinse; put in nickel tank for 1½ hours; remove; rinse; rinse in hot water, then buff.

We hold our pH between 5.8 and 6.0. To control pH we use muriatic and ammonia. For pitting, we use sodium perborate. We do not know the original formula, but for stock solution we use 8 ozs. double salts; 8 ozs. single salts; 2 ozs. boracic acid; 2 ozs. sal-ammoniac, to 1 gallon of water.

In Tank No. 1 we have 31 anodes of 99%+. The distance between anode and cathode is 6½", length of tank 71", width of tank 30", depth of solution 27".

In Tank No. 2 we have 30 anodes 95-97. The distance between anode and cathode is 6½", length of tank 71", width 30", depth of solution 27".

A.—Analysis of nickel solutions:

	Metallic nickel ozs.	Chlorides ozs.	pH
1	3.58	3.76	4.0
2	3.54	3.62	5.2

The metal and chloride contents are fairly good, but the pH of both solutions is entirely too low. Would suggest that you add 160 fluid ozs. of 26° ammonia to No. 1 tank and 25 fluid ozs. of ammonia to No. 2 tank to correct the pH.

Problem 5,385.

Plating Zinc Base Alloy

Q.—We have been having considerable trouble plating a 95% Zn 5% Al alloy as it becomes blistered inside of a week to 10 days after we have plated it. We would ask that you kindly advise us the proper plating solutions.

A.—Copper coatings applied to zinc alloy parts frequently blister on standing. The application of nickel directly on the zinc will avoid this difficulty. We would suggest that you use the following formula for the nickel solution for your class of work:

Single nickel salts	12 ozs.
Nickel chloride	4 ozs.
Boric acid	4 ozs.
Sodium sulfate	12 ozs.
Sodium citrate	1 oz.
Water	1 gallon

Adjust the pH to 6.0 by adding ammonia.

A mild alkaline cleaning solution should be used for cleaning and a dilute muriatic or acetic acid pickle before plating instead of the cyanide dip.

Problem 5,386.

Silver and Silver Strike

Q.—We are forwarding sample of our silver plating solution. It was originally made up as follows:

Silver cyanide	3½ ozs.
Sodium cyanide	5 ozs.
Ammonium chloride	½ oz.
Water	1 gal.

Kindly advise us what to do with it. We have made this up in about a 20-gal. tank.

How would you make up a silver strike?

A.—Analysis of silver solution:

Metallic silver	2.32 ozs.
Free cyanide	4.18 ozs.

This silver solution should be operating satisfactorily and if you are having any trouble it is probably due to the silver strike. In making a silver strike solution for the ordinary run of work use the following formula:

Silver cyanide	½ oz.
Sodium cyanide	8 ozs.
Water	1 gal.

Problem 5,387.

Statuary Bronze Finish

Q.—We are having some difficulty in getting the desired finish on placques made of commercial bronze sheets. We would like to have an even statuary bronze finish, not too dark, so as to make it look old.

A.—Copper coatings applied to zinc alloy parts frequently blister on standing. The application of nickel directly on the zinc will avoid this difficulty. We would suggest that you use a bronzing solution made of liquid sulfur 1 oz., yellow barium sulphide 1 oz., water 1 gallon, used hot to produce the finish.

The color desired can be obtained by using a fine crimped steel or nickel silver wire when operated at 800 to 1000 R.P.M.

Proper brushing is essential in producing any bronze finish.

Problem 5,388.

Patents

A Review of Current United States Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,975,113. October 2, 1934. **Heat Treatment of Copper-Beryllium Alloys.** Georg Masing, Berlin, and Otto Dahl, Berlin-Charlottenburg, Germany.

1,975,115. October 2, 1934. **Article Subject to Abrasion.** Georg Masing, Berlin, and Otto Dahl, Berlin-Charlottenburg, Germany.

1,975,120. October 2, 1934. **Alloy.** Roy E. Paine, Cleveland, Ohio, assignor, by mesne assignments, to Magnesium Development Corporation.

1,975,216. October 2, 1934. **Copper Base Alloy.** Joseph Wecker, Aachen, Germany.

1,975,227. October 2, 1934. **Method, Apparatus, and Elements Thereof for Use in the Electrodeposition of Chromium.** Charles H. Eldridge, Detroit, Mich., assignor to United Chromium, Incorporated, New York, N. Y.

1,975,239. October 2, 1934. **Method of Chromium Plating.** Alfred Ungelenk, Rudolstadt in Thuringen, and Johannes Fischer and Heinz Endrass, Berlin-Charlottenburg, Germany, assignors to Siemens & Halske, Aktiengesellschaft, Siemensstadt, near Berlin, Germany.

1,975,375. October 2, 1934. **Alloy.** Georg Schichtel, Dobriach-on-Millstattersee, Austria, assignor to American Magnesium Metals Corporation, Pittsburgh, Pa.

1,975,376. October 2, 1934. **Alloy.** Georg Schichtel, Dobriach-on-Millstattersee, Austria, assignor to American Magnesium Metals Corporation, Pittsburgh, Pa.

1,975,742. October 2, 1934. **Composite Metal Article.** James H. Critchett, Douglaston, N. Y., assignor to Electro Metallurgical Company.

1,975,818. October 9, 1934. **Coating for Pistons.** Harold K. Work, Oakmont, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa.

1,975,966. October 9, 1934. **Casting Machine.** Louis H. Morin and Davis Marinsky Bronx, N. Y., assignors, by direct and mesne assignments, to Whitehall Patents Corporation, New York, N. Y.

1,976,092. October 9, 1934. **Apparatus for Welding with Copper.** Bert L. Quarnstrom, Detroit, Mich., assignor to Bundy Tubing Company, Detroit, Mich.

1,976,225. October 9, 1934. **Refining White Metal Scrap.** George O. Hiers, Brooklyn, N. Y., assignor to National Lead Company, New York, N. Y.

1,976,295. October 9, 1934. **Alloy, Electron Emitter, and Method of Making Same.** Donald W. Randolph, Flint, Mich., assignor, by mesne assignments, to General Motors Corporation, Detroit, Mich.

1,976,333. October 9, 1934. **Treatment of Alloys.** Joseph C. Dittmer, St. Albans, N. Y., assignor to National Lead Company, a corporation of New Jersey.

1,976,375. October 9, 1934. **Beryllium-Aluminum Alloy and Method of Heat Treating the Same.** Joseph Kent Smith, Detroit, Mich., assignor to The Beryllium Corporation, New York, N. Y.

1,976,803. October 16, 1934. **Copper Alloy.** William B. Price, Waterbury, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn.

1,976,991. October 16, 1934. **Tube Feeding and Stripping Device.** Andrew J. Hersam, West New York, N. J., assignor to Aluminum Company of America, Pittsburgh, Pa.

1,977,049. October 16, 1934. **Grinding Machine.** Owen Doutt, Detroit, Mich., assignor, by mesne assignments, to General Spring Bumper Corporation, a corporation of Michigan.

1,977,112. October 16, 1934. **Branch-Fitting for Tubes and the Like.** John S. Coe, Waterbury, Conn., assignor to The Chase Companies, Incorporated. Waterbury, Conn.

1,977,173. October 16, 1934. **Electrolytic Production of Powdered Metals.** William Mario Costa, Kew Gardens, N. Y.

1,977,388. October 16, 1934. **Induction Electric Furnace.** Heinz Ilberg, Berlin-Charlottenburg, Germany.

1,977,432. October 16, 1934. **Lead Bend and the Like.** Robert Dick, Bergenfield, N. J., assignor to National Lead Company, a corporation of New Jersey.

1,977,562. October 16, 1934. **Art of Working Metals.** Herbert R. Treuting, Newark, N. J., assignor to American Machine & Foundry Company, New York, N. Y.

1,977,622. October 23, 1934. **Method of and Bath for Anodic Treatment of Aluminum.** Robert W. Buzzard, Kensington, Md.

1,977,639. October 23, 1934. **Metal Protected Mirror.** Seth C. Langdon, Evanston, Ill., assignor to Curtis Lighting, Inc., Chicago, Ill.

1,977,646. October 23, 1934. **Method of Etching Planographic Plates and Composition Therefor.** George S. Rowell, Cleveland, Ohio, assignor to Multigraph Company, Wilmington, Del.

1,977,652. October 23, 1934. **Manufacture of Resins for Lacquers, Varnishes, and the Like.** Norman Strafford and Eric Everard Walker, Blackley, Manchester, England, assignors to Imperial Chemical Industries Limited, London, England.

1,977,851. October 23, 1934. **Stamper and Hammer for Foundries.** Heinrich Hepperle, Mulheim-on-the-Ruhr-Speldorf, Germany.

1,978,037. October 23, 1934. **Method and Apparatus for Electrodeposition.** Charles E. Yates, Perth Amboy, N. J., assignor, by mesne assignments, to Anaconda Copper Mining Company, New York, N. Y.

1,978,112. October 23, 1934. **Non-seizing Article of Aluminum and Method of Producing the Same.** Seth G. Malby, Tenafly, N. J., assignor, by mesne assignments, to Aluminum Company of America, Pittsburgh, Pa.

1,978,537. October 30, 1934. **Process of Refining Metals.** William R. Jeavons, Cleveland Heights, and Mahlon J. Rentschler, Willoughby, Ohio.

1,978,791. October 30, 1934. **Chromium Plating of Type.** Philip P. Hale, Toledo, Ohio.

1,978,894. October 30, 1934. **Rolling Mill.** Walter R. Clark, Bridgeport, Conn.

1,978,895. October 30, 1934. **Apparatus for Rolling Metal.** Walter R. Clark, Bridgeport, Conn.

1,978,976. October 30, 1934. **Manufacture of Lead Tubes and Cable Sheaths.** Georg Zapf, Cologne, Germany, assignor to Felten & Guilleaume Carlswerk Aktiengesellschaft, Cologne - Mulheim, Germany.

1,979,254. November 6, 1934. **Lead-Sodium Alloy.** Frederick Baxter Downing, Carneys Point, and Louis S. Bake, Pennsgrove, N. J., assignors to E. I. du Pont de Nemours & Company, Wilmington, Del.

1,979,452. November 6, 1934. **Magnesium Alloy.** Hugh S. Cooper, Cleveland, Ohio, assignor to Kemet Laboratories Company, Inc., a corporation of New York.

1,979,486. November 6, 1934. **Method of Coating Metallic Objects.** Myron L. Myers, Elizabeth, N. J., assignor to United Dry Docks, Incorporated, New York, N. Y.

1,979,539. November 6, 1934. **Method of Production of Refractory Metal Leaf.** Bernard C. Gardner and Russell H. Varian, Philadelphia, Pa., assignors to Television Laboratories, Ltd., San Francisco, Calif.

1,979,581. November 6, 1934. **Molding Machine.** Evans M. Staples, Cincinnati, Ohio, assignor to Aluminum Industries, Inc., Cincinnati, Ohio.

1,979,697. November 6, 1934. **Annealing Furnace.** Albert Maring, Muskegon, Mich., assignor to Anaconda Wire & Cable Company, New York.

1,979,996. November 6, 1934. **Electroplating Process.** William M. Phillips, Birmingham, and Guy M. Cole, Detroit, Mich., assignors to General Motors Corporation, Detroit, Mich.

1,980,263. November 13, 1934. **Process of Smelting Aluminum.** John G. G. Frost, Cleveland, Ohio, assignor to The National Smelting Company, Cleveland, Ohio.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Zam Anodes

The Hanson-Van Winkle-Munning Company, Matawan, N. J., announces the development of a new anode named Zam (zinc, aluminum, mercury). It is stated that this new anode is not attacked by either acid or cyanide solutions until the current is applied; that consequently the anode is free from sludge, and can be completely used up in a zinc solution. It is claimed that no sludge will be found in the bottom of a tank regardless of how long the anodes are used. No sludge on the anode means no anode polarization. Therefore practically no increase of voltage will be required at any time, either at the start of or during the plating, whether the run is short or very long. This permits setting the rheostat at a required point with complete assurance that the desired amount of zinc will be deposited in the given time.

When ordinary zinc is used, a higher voltage is necessary to obtain the required current density as the anode coats over with decomposed zinc. The higher pressure results in more hydrogen being included in the deposit and, therefore, heavy deposits become brittle and non-adherent. On wire or BX cable, for instance, with ordinary zinc anodes in the solutions commonly used, a deposit that will withstand more than two Preece Tests is difficult to obtain. With Zam Anodes, it is stated that a deposit can be obtained, without any extra precautions, that will withstand six Preece Tests. The absence of hydrogen in the deposit due to the ability to plate at high current densities and low pressure makes it possible to obtain a ductile, adherent deposit that can be easily formed without any danger of cracking or abnormal distortion.

Cyanide zinc solutions can be obtained at a fairly constant metal content by the use of steel containers and ball anodes. As the anodes do not develop any coating while the plating is being done and remain clear and clean, there is no contact resistance between the Zam balls. A container of Zam balls will give higher efficiency than a continuous bar anode, but if bars or plates are required for anodes, the same physical properties of clean, clear surface are obtained.

The manufacturers state that a Zam anode can be used in cadmium solutions and will convert such solution into zinc solutions without any trouble whatever. The plating operations can be carried on without interruption until the cadmium solution is completely converted to a zinc solution. Then the highest efficiency of zinc deposition from a cyanide solution can be obtained.

Zam Anodes are being used by prominent wire and cable manufacturers, leading automobile manufacturers, hardware manufacturers and automotive accessory manufacturers.

Sodium Zinc Alloy

A sodium-zinc alloy, which the manufacturers describe as a new metallurgical tool for the prevention of certain types of flaws in brass casting, has been developed jointly by the Grasselli Chemical Company of Cleveland, Ohio, and the R & H Chemicals Department of E. I. du Pont de Nemours and Company of Wilmington, Del. This material is offered to fill the long-felt want of eliminating casting flaws which have always been the bane of the foundryman. It is recommended for all non-ferrous alloys containing 2% or more of metallic zinc.

The composition of this alloy is 98% zinc and 2% metallic sodium. It melts at about 140 degrees C. higher than pure zinc. It is brittle and can, therefore, be easily broken up for use in the desired quantities.

When a heat of brass is almost ready to pour, the requisite quantity of sodium zinc alloy is added in solid form. It sinks to the bottom of the bath and breaks down into its components, zinc and sodium. The sodium rapidly reduces the metallic oxides present regardless of their state, producing sodium oxide which boils at 880 degrees C. with a bubbling and stirring action. In mixing the original batch of metal allowance must be made for the zinc content in the sodium zinc alloy in order to produce the correct final product.

It is stated by the manufacturers that the sodium zinc alloy has practically no effect on the physical properties of the brass or other mixtures to which it is added except for the cleansing action with the additional strength, ductility, etc., which would naturally result. It is recommended also for other alloys besides brasses; copper-silicon for example.

The primary advantages claimed for this material are its cleansing action on the melt and its stirring action which eliminates the need for mechanical puddling to prevent segregation.

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Small, low priced 100 Ampere Welder. Type SA-100, for light, thin-gauge materials. Lincoln Electric Company, Cleveland, Ohio.

75 Ampere Arc Welder. Designed especially for light gauge welding. Hobart Brothers, Troy, Ohio.

Starbright. Nickel Plating Solution. A bright nickel solution said to give ductile deposits capable of being covered with chromium. Heavy deposits can also be produced. Suitable for deposition on brass, tin, iron and steel. Coleman and Appleby, Ltd., Constitution Hill, Birmingham, England.

New Brazing Flux

Handy and Harman, 82 Fulton Street, New York, have placed on the market the Handy Flux for low temperature brazing of non-ferrous metals and alloys, such as copper, brass, bronze, aluminum bronze, beryllium copper, Monel metal, nickel, etc. It is also recommended for brazing steel and stainless steel.

Some of the features claimed for this material are as follows:

It is all fluid and active at 1200°F.

It dissolves practically all refractory oxides including those of chromium.

It works effectively with alloys flowing between 1200 and 1600 degrees F., remaining stable without blowing or bubbling away under the torch.

Being in paste form and capable of thinning by water, it is easy and convenient to use.

Excess flux is easy to remove after brazing, being softened and dissolved by hot water.

Control Units

Tagro Chemical Company, Inc., of 108 Fulton Street, New York City, are now marketing a new and simplified method of analyzing and controlling plating solutions. While they claim the results obtained are as accurate as those obtained by the chemist, they further claim that the plater, with no knowledge of chemistry, but by the use of the Tagro Control Units, will be able completely to analyze a plating solution within five minutes. They claim that the Tagro Units are based upon sound

quantitative analysis principles, but are so simplified that, as an example, the plater will be able to get the metallic content of a nickel bath to within 1-100th part on an ounce per gallon, without the use of a pencil or paper.

They say this is possible because of a very simple slide rule which they have perfected, which synchronizes with new standard solutions in connection with other copyrighted forms, and new and original glassware.

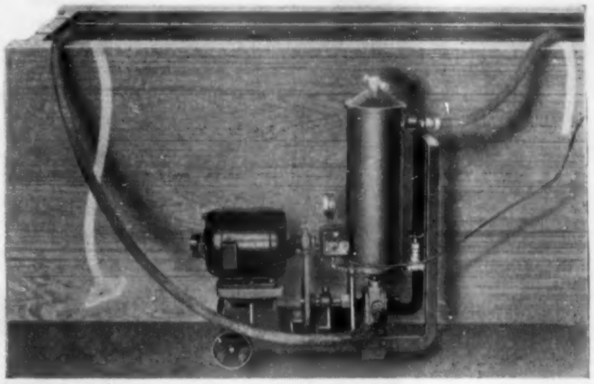
Tagro Units are available for all the ingredients in acid copper, cyanide copper, brass, bronze, silver, nickel and cadmium solutions.

A circular describing the Tagro Units will be forwarded upon request.

Solution Filter

The Sterling filter made by the Sterling Manufacturing Company, 43 Hospital Street, Providence, R. I., is designed to filter nickel, acid copper, cyanide copper, cadmium, silver and other solutions without interrupting the operations of the plant. The equipment, it is stated, is constructed on an entirely new principle. The filtering element consists of two metal cylindrical screens, one inside the other, the inner screen being covered with two layers of special cloth. The cloth can be removed for cleaning or replacement within four minutes. Three cloths are furnished with the unit.

Sterling Solution Filter



The filter is equipped with two lengths of hose. One of these lengths, to which a strainer is attached, is placed in one end of the tank and the other hose acts as the outlet of the clean solution, being placed in the other end of the tank. When the filter is placed in operation by simple connection with an electric outlet, the solution in the tank is set in circulation, dislodging the sediment at the bottom and thus, it is stated, completing the entire cleaning process thoroughly. When the capacity of the filter cloth has been used up, an automatic pressure switch stops the motor, thus warning the operator that it is necessary to put in a fresh cloth.

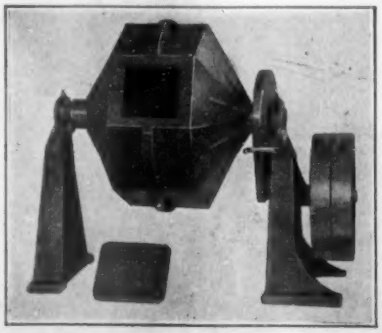
The Sterling filter has a capacity of 400 gallons per hour, and is operated by a ½ H.P., 110 volt, 60 cycle motor. Other voltages can be furnished if desired.

Triple Action Cutting Barrel

A new type of tumbling barrel has been developed by the Hartford Steel Ball Company, Hartford, Conn., called the Triple Action Cutting Barrel. The inside of the barrel is so constructed as to produce a rapid flowing motion, which if the barrel is properly loaded, acts rapidly to grind off burrs and fins, and generally smooth the surface.

The barrel, it is stated, cuts down considerably the length of time required to finish the work. It has self-aligning roller bearings, roller chain drive, special belt shifter and other special construction features.

One of the most important uses for which this barrel is recommended is wet grinding, sometimes called sand rolling. It is also recommended for operations employing oil and emery, and dry grinding, pulverizing or mixing.

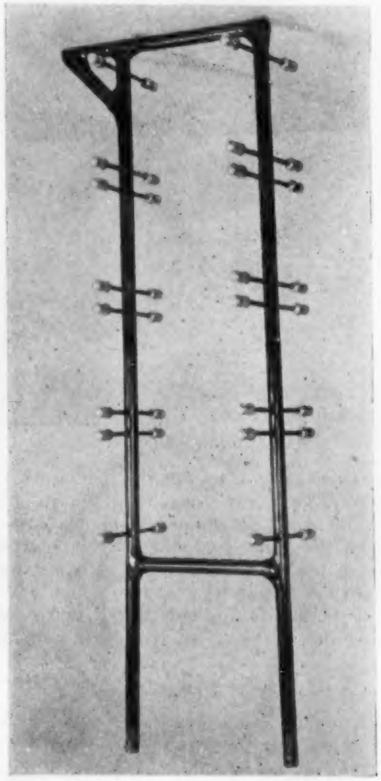


Triple Action Cutting Barrel

Plating Rack Coating

A new coating for plating racks which is both corrosion-resistant and non-contaminating, is announced by The B. F. Goodrich Company, Akron, Ohio.

Known as "Korolac," the coating possesses high dielectric resistance and is translucent, tough and inert. Immersion tests indicate that it is not affected by those solutions ordinarily used in the following plating baths: chrome, nickel, cadmium, zinc, copper, brass, silver, etc.



Rack Covered With Korolac

At normal temperatures, Korolac is a jelly-like material but when heated becomes liquid. When cooled, it shrinks, seizes the metal, holds its position.

Wider industrial uses for Korolac are predicted by the manufacturers.

Hot Zinc Process

A new method of hot galvanizing is being introduced in Great Britain known as Aplataer. The principal feature of this process is that the greater part of the bath is filled with molten lead on which a patented dividing liquid floats which in turn supports a layer of pure zinc a few inches deep. It is claimed that these three materials do not mix but always settle down to their correct positions. Among the advantages claimed are a minimum of waste zinc, in the form of hard spelter or dross; increased flexibility of the coating and the elimination of flaking and cracking. The method has been introduced by J. M. J. Maus and Winn, 35 New Broad Street, London, E.C.2, England.—A. E.

Scrap Metal Baling Press

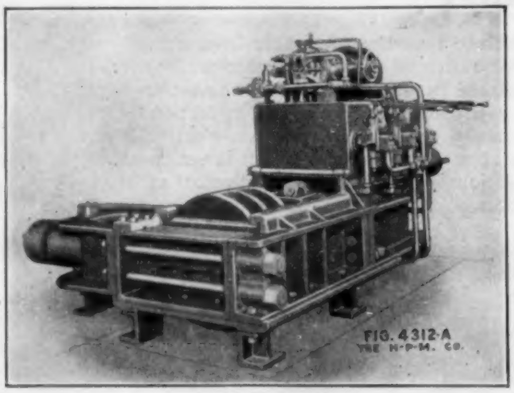
A recent development of The Hydraulic Press Manufacturing Company, Mount Gilead, Ohio, designers and builders of H-P-M Hydro-Power Presses is a Box Type Scrap Metal Baling Press, incorporating the H-P-M Hydro-Power principle of operation.

The H-P-M Baling Press is completely self-contained with its motor driven H-P-M Hydro-Power Unit mounted directly on the press at one end. The Press consists of a box built up of massive ribbed steel castings to take the loose scrap metal. It is closed by a heavy sliding door, actuated by a hydraulic cylinder.

Pressure is applied to the scrap from two directions—first from the end, and then from the side by platens moving into the box operated by hydraulic rams. The application of the pressure is controlled through three lever actuated valves.

Two pumps, each of the rotary high-speed oil pressure type, build up the pressure. The first pump delivers a large volume of oil at medium pressure; the second pump, the new H-P-M Variable Delivery Radial Type builds pressure up to maximum. An H-P-M Control automatically regulates the pump's pressure and volume of output.

Box Type Scrap Metal Baling Press



Compactness, smooth action, speed of operation, ease of control and bales of high density are among the desirable features claimed for this new H-P-M Scrap Metal Baler.

New Roll Grinder Drive

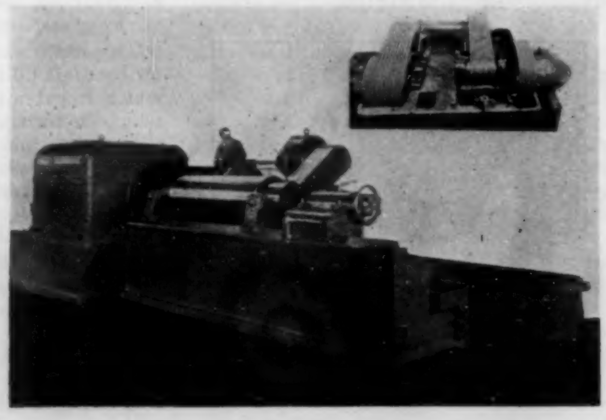
The major requirement of the modern roll grinding machine is the combination of accuracy, finish and speed. Metal strip and sheet for many purposes, such as automobile bodies, refrigerator cabinets, furniture, etc., must be rolled with a high finish and be free from marks which impair the smoothness of lacquer coatings. The roll grinding machine, therefore, must be capable of applying the finest mirror surface on rolls for rolling high finish sheets. It must be equally capable of taking heavy cuts for rough grinding and of refinishing rolls with the required accuracy and finish in the shortest possible time.

To eliminate the vibrations inherent in even the most accurate and carefully mounted gear-driven headstocks, with consequent marking of rolls, requiring much time and trouble to remove, the 36" x 12'0" Farrel Heavy Duty Roll Grinder shown in the accompanying illustration is built with a multiple V-belt drive for rotating the rolls. The performance of several of these machines so equipped has, it is stated, proven conclusively that a much better finish is obtained in a shorter time. In one mill rolls that formerly required five to six hours are now being finished in two hours with a perfect surface free from marks of any kind. In this mill they are getting results in improved quality of output and increased grinder capacity that they had thought could never be attained on any roll grinder.

Standard features of Farrel grinders have all been incorporated in this machine, with improvements wherever possible. These include a patented cambering device which produces a mathematically accurate curve for a crowned or concaved roll, exactly symmetrical both sides of the center of the roll; dead center head and footstocks; water-shedding front bed; centralized controls at the operator's station; flood lubricated, inverted "V" ways; flexible steel covers for the carriage ways and drive rack; double helical gear to worm and rack traverse drive; and multiple "V" belt spindle drive.

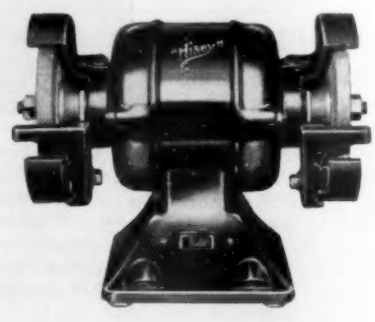
This machine is made by the Farrel-Birmingham Company, Ansonia, Conn.

New Farrel Roll Grinder



Bench Grinder

A new ¼ H.P. bench grinder, which is made for both direct and alternating current has been devoleped by Hisey Wolf Machine Company, Cincinnati, Ohio. This grinder carries a 6" wheel, is equipped with ball bearings, with seals excluding dust and grit, and is suitable for light tool and miscellaneous grinding jobs. It can be furnished also with a pedestal if desired.



Small Bench Grinder

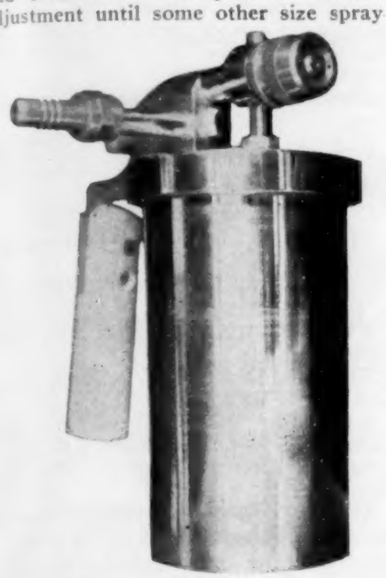
New Spray Machine

The first small sprayer, with cup attached and without a needle, to have a flat spray is featured in the "Duquesne" Flat Spray Machine manufactured by the O. Hommel Company, 209 Fourth Avenue, Pittsburgh, Pa. A specially designed nozzle flattens out the spray, in order to enable it to cover large areas evenly and in much less time than with the ordinary round spray.

The "Duquesne" Flat Sprayer is said to combine the best features of two other Hommel machines. It features the short-nosed nozzel of the "Bull-Dog" and its sturdy construction, with the comfortable "pistol" grip of the "Keystone."

The "Duquesne" is designed to handle heavy liquids such as lacquers, enamels, glazes, bronzes and like materials, and for covering large surfaces quickly it is strongly recommended.

The regulator on top of supply tube controls the volume of fluid desired for spraying. Once set by adjustment, the flow of material will remain constant and even and will require no further adjustment until some other size spray



Duquesne Flat Sprayer

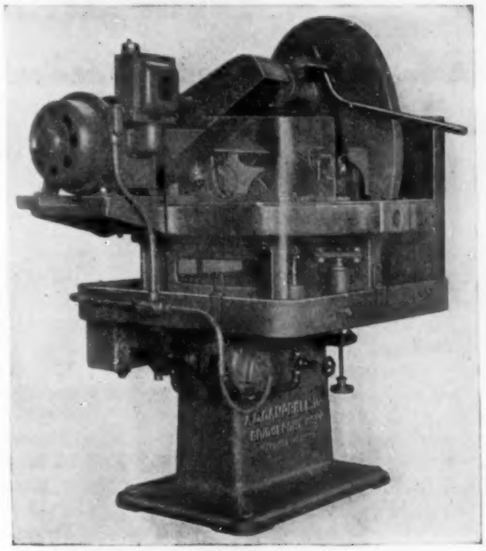
is wanted. By removing the regulator, the reservoir can easily be cleaned of any material which may have become hard, a feature which will often be appreciated.

The "Duquesne" is made of solid brass, heavily nickel plated and has no soldered joints. It is finished like all Hommel air brushes with coupling at the hose end so that the machine can be detached and attached to a hose at any part of the shop in a few seconds, without loss of time.

Wet Abrasive Cutter

This new development in cutting machines is said to be unique in the method used for supplying the cutting disc with a liquid coolant. The disc by its own speed collects the proper amount of coolant and directs it against and into the cut being made. Continuous and uniform quantities of liquid are said to be assured, resulting in equal wear on both sides of the disc, longer disc life, elimination of burning or surface hardening, improved finish on cuts, and reduction in cutting costs. The machine cuts materials such as non-ferrous alloys and many other materials in solid bar up to three inches in diameter or tubings up to three and one-half inch diameter.

The machine is made in two models, No. 202 on which work clamp is operated by foot treadle, and Model No. 203 which has an automatic electrically operated clamp. Both models have pedestal bases and all moving parts are protected yet easily accessible. Detailed literature and advice on cutting problems will be sent on request to the manufacturer by the Andrew C. Campbell Division of American Chain Company, Inc., Bridgeport, Conn.



Wet Abrasive Cutting Machine

Catalogs

Combination Sink Faucets; Compression Lawn Faucets. The Royal Brass Manufacturing Company, Cleveland, Ohio. (350)

Spectrographic Equipment. Bausch and Lomb Optical Company, Rochester, N. Y. (351)

Methods of Handling Customer Complaints. Policyholders Service Bureau, Group Insurance Division, Metropolitan Life Insurance Company, 1 Madison Avenue, New York. (352)

Production Tube Bender. Parker Appliance Company, Cleveland, Ohio. (353)

Meters for Steam, Liquids, Gas. A 48-page bulletin covering complete line of Foxboro meters for industrial uses. Of special interest is the new Universal flow meter. Foxboro Company, Foxboro, Mass. (354)

Metallic Zinc Powder in Industrial Paint. Special reference to the new non-gassing zinc dust. Recommended as a primer and finishing coat for iron, steel and galvanized surfaces. New Jersey Zinc Company, 160 Front Street, New York. (355)

Precision Measuring Instruments. A series of blue print post cards on the use of manometers, flow meters, draft gauges, pulsation absorbers, etc. Meriam Company, 1955 W. 112th Street, Cleveland, Ohio. (356)

Chemical Control Units for Analyzing the Plating Bath. Tagro Chemical Company, Inc., 106 Fulton Street, New York. (357)

Potentiometer Pyrometers. Brown Instrument Company, Philadelphia, Pa. (358)

Noel Speed Arc High Efficiency, High Power Factor Welders. Ideal Electric & Manufacturing Company, Mansfield, Ohio. (359)

Surface Pyrometer. Bulletin No. 60. Pyrometer Instrument Company, 103 Lafayette Street, New York. (360)

Inventory Control Methods. Policyholders Service Bureau, Metropolitan Life Insurance Company, 1 Madison Avenue, New York City (361)

Industrial Indicating Thermometers, Temperature and Humidity Recorders. H-B Instrument Company, Inc., 2518 N. Broad Street, Philadelphia, Pa. (362)

Save time. Use the coupon below to get any of the above catalogs or bulletins, or for data on any subject not mentioned this month. METAL INDUSTRY will see that you get them promptly.

METAL INDUSTRY
116 John Street, New York.

(Insert below the number in parentheses at end of each item desired.)

I wish to receive the following catalogs mentioned in May, 1935

....

....

Name .... **Address** ....

Associations and Societies

American Electroplaters' Society

1935 Convention, Bridgeport, Conn., June 10-13.

The secretary of every branch is urgently requested to co-operate with George B. Hogaboom, Chairman of the Branch Societies' Exhibits Committee, in sending exhibits of electroplated products or special finishes that their members are producing, to be shown at the convention. Already definite plans have been made for more than 50 exhibits, but the Convention Committee is anxious to get as many more as possible.

Each secretary is urged to communicate at once with Mr. Hogaboom at 557 Stanley Street, New Britain, Conn., giving the names of the Exhibits Committee for his Branch.

Convention Program

The program for the convention has been tentatively arranged as given below.

Monday, June 10th

8:30 Registration—Hotel Stratfield.

9:00 Welcoming of delegates, members and visitors; Ray O'Connor, chairman, General Committee; Joseph Sexton, President, Bridgeport Branch.

Welcome to Bridgeport.
Mayor of Bridgeport.

Opening Session—
Charles H. Proctor, presiding—Founder A.E.S., 1909.

Presidential Address—"The A.E.S." H. A. Gilbertson.

Business Session—
Presentation of Credentials.
Submission of amendments to constitution.

1:30 P. M. Educational Session—Mosque Temple. William Phillips presiding, Chairman, Research Committee.

1. The Manufacturer and the Plater. A. P. Munning, Hanson-Van Winkle-Munning Co.
2. Report of Research Work. Dr. William Blum, U. S. Bureau of Standards; Paul W. Strausser, A.E.S. Research Associate.
3. The Effect of Different Acids on Cold Rolled Steel. E. T. Candee, Chief Chemist, American Metal Hose Co., Waterbury, Conn.
4. The Adhesion of Electodeposits. Walter R. Meyer, Research Chemist, General Electric Co., Bridgeport, Conn.

Tuesday, June 11

9:00 A. M. New England Session—Stratfield Hotel. Thomas H. Chamberlain presiding.

1. Black Nickel Plating. Joseph Downes, Remington-Rand, Inc., Middletown, Conn.
2. Plating Antimonial Lead. Clarence Hemle, Walter R, Meyer, General Electric Co., Bridgeport, Conn.
3. Barrel Finishing, Plating and Burnishing. William Delage, The Oakville Division, Scovill Mfg. Co., Oakville, Conn.
4. Spotted Out of Plated Cast Iron. Walter W. Rowe, North and Judd Co., New Britain, Conn.
5. Electroplating Zinc Base Die Castings. Charles Costello, C. Cowles Co., New Haven, Conn.
6. Coloring of Metals. Harry MacFayden, Arrow-Hart-Hegeman Electric Co., Hartford, Conn.

7:45 P. M. Hotel Stratfield. Dr. William Blum presiding.

1. The Mechanism of Electroplating. Dr. Hiram S. Lukens, University of Pennsylvania, Philadelphia, Pa.
2. Spectrograph Analysis as Applied to Electroplating. Dr. D. T. Ewing, Michigan State College, Lansing, Mich
3. X-ray Diffraction of Metals. Dr. H. R. Isenburger, St. John X-ray Laboratories, Long Island City, N. Y.
4. Measuring Thickness of Electrodeposits with a Microscope. Dr. Carl Heussner, Technical Director, The Chrysler Corp., Detroit, Mich.

Wednesday, June 12th

7:45 P. M. Mosque Temple. President H. A. Gilbertson presiding

1. Air Conditioning of Plating, Buffing and Lacquering Rooms. A. W. Knecht, Consulting Engineer, Graybar Building, New York, N. Y.
2. Brightening Up the Plating Room. J. A. Coolahan, Hercules Powder Co., Wilmington, Del.
3. Why Metals Corrode. Dr. Robert A. Burns, Assistant Chief Chemist, Bell Telephone Laboratories, New York, N. Y.
4. Methods for Prevention of Season Cracks of Brass in Electroplating. B. J. McGar, Assistant Chief Metallurgist, The Chase Companies, Waterbury, Conn.

Thursday, June 13th

9:00 A. M. Stratfield Hotel. Thomas A. Slattery, Vice President, A.E.S., presiding.

1. Electrodeposition of Tin. E. A. Shields, Chief Metallurgist, Westinghouse Electric and Manufacturing Co., Springfield, Mass.
2. Optimum Metal Concentration of Nickel Solutions. Dr. D. A. Cotton, Chief Research Engineer, Delco-Remy Corp, Anderson, Ind.
3. The Relative Value of Accelerated Corrosion and Outdoor Exposure Tests. Dr. William Blum, Chemist, U. S. Bureau of Standards, Washington, D. C
4. Adventures in Electroplating Copper from Ammoniacal Solutions. Dr. E. A. Vuilleumier, Dickinson College, Carlisle, Pa.

Exhibition of Equipment and Supplies

Since the publication of our last issue, the following firms have contracted for space in the exhibit (in addition to those published in our March and April issues):

Chromium Process Company, Derby, Conn.

E. I. Du Pont de Nemours Co., R. & H. Chemicals Division, Wilmington, Dela.

De Vilbiss Company, Toledo, Ohio.

Bausch and Lomb Optical Company, Rochester, N. Y.

Magnus Chemical Company, Garwood, N. J.

Metal Industry, 116 John Street, New York.

Hammond Machinery Builders, Inc., Kalamazoo, Mich.

McCathron Boiler Works, Inc., 72 Knowlton Street, Bridgeport, Conn.

General Electric Company, Schenectady, N. Y.

Available booths are rapidly being taken up. Manufacturers of electroplating equipment and supplies are urged to make their reservations without delay. Communicate with R. T. Phipps, Manager of Exhibits, 271 Grovers Avenue, Bridgeport, Conn.

Best Branch Exhibit Will Receive Metal Industry Cup

The **Metal Industry** will present a Silver Cup to the Branch Society that has the best exhibit at the Exposition of the Society.

This Cup will be held by a Branch Society one year. If, however, it is won by the same Branch three years in succession it becomes theirs permanently.

Milwaukee Branch

Care of Frank J Marx, 1431 W. Cherry Street, Milwaukee, Wis.

The annual educational meeting and smoker of the Milwaukee Branch, held on Saturday, March 30th, was the most successful meeting ever held by the Branch. The attendance was over 200. Delegates came from the principal cities of Wisconsin, Minnesota, upper Michigan and Illinois. The speakers, George **B. Hogaboom, H. A. Gilbertson** and **W. H. Phillips,** were well received, their talks attracting a great deal of interest and discussion.

New York Branch

Care of F. J. MacStoker, 25 Princeton Street, Garden City, N. Y.

The first meeting in March, held on March 8, was attended by 35 members.

A special talk was given by J. B. **Kushner** on the topic "Precious Metal Losses in Plating Procedure." The talk was decidedly interesting to the members who discussed the paper at length.

Other speakers of the evening were **Charles H. Proctor, Founder of the Society**, and **William Schneider** of the R & H Chemicals Division of the DuPont company. Mr. Schneider gave his impressions of the progress in electroplating as he had found it in his visits to many plants in the country. He emphasized the improvement in plating die castings and also in degreasing methods.

Providence-Attleboro Branch

Care of J. H. Andrews, 19 Rosedale Street

Seventy-five members and guests of the Providence Branch of the American Electroplaters Society heard **Dr. K. Schumpelt,** chief electro-chemist of Baker & Company, Newark, N. J., speak at their meeting Friday evening, March 22 in the Metcalf Laboratory, Brown University. Dr. Schumpelt discussed the subjects of "Six Years of Rhodium Plating" and "Latest Developments in Gold Plating." Among the guests were a number of owners, foremen and superintendents of local manufacturing jewelry plants.—W. H. M.

American Society for Testing Materials

260 South Broad Street, Philadelphia, Pa.

In order to provide ample time for the presentation of the many technical reports and papers which will be presented at the Thirty-eighth Annual Meeting of the A. S. T. M. to be held in The Book-Cadillac, Detroit, June 24-28, sixteen sessions are scheduled. During the five days of the annual meeting, the Society's Third Exhibit of Testing Apparatus and Related Equipment will be in progress. Latest developments in the testing and scientific instrument field will be on display.

The Tuesday afternoon meeting will comprise a session on testing, including papers on elastic strength and its determination, hardness testing of light metals and alloys, relation between tension, static and dynamic tests and description of a new method for dynamic hardness testing.

The Edgar Marburg Lecture will be given Wednesday afternoon. **Dr. L. B. Tuckerman** of the National Bureau of Standards will deliver the lecture on **"Aircraft: Materials and Testing."** The annual A. S. T. M. dinner is to be held Wednesday evening and will be followed by two addresses on "The Relationship of Materials to the House of Today and Tomorrow." An official of the Federal Housing Administration will give the viewpoint of the Government, and an outstanding authority on the subject of modern housing will deliver an illustrated lecture on what is being done in this country and abroad to solve vital housing problems.

A session on Thursday evening will be devoted to fatigue and effect of temperature on metals. Papers cover tests on tin bronzes at elevated temperatures, creep characteristics of aluminum alloys, high speed fatigue tests on metals, and a fatigue machine for testing small diameter wire.

A session will also be held on Friday morning, devoted to spectrographic analysis of materials, steel, platinum, etc.

One of the outstanding sessions of the meeting is to be held Friday afternoon, devoted to committee reports and papers in the non-ferrous metals field. Papers discuss the following subjects: making and testing single lead crystals; testing in the precious alloy field; present-day testing requirements in precious metal duplex alloys. A number of the non-ferrous committee reports will include data of wide interest and value.

Exhibit of Testing Apparatus and Related Equipment

In addition to displays by leading companies in the testing instrument and related apparatus fields, the A. S. T. M. Exhibit will include non-commercial apparatus sponsored by A. S. T. M. committees or research laboratories for the carrying out of special tests and research work. In this group of displays there will be a special high-speed fatigue testing machine, a low capacity impact machine, a machine for making bending tests in wire used for mounting vacuum tube elements, apparatus used for special tests of electrical insulating materials and others.

A. S. T. M. Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys plans to have an extensive display of the large number of atmospheric, galvanic, electrolytic and immersed test specimens which it has collected from the various test racks throughout the country after being examined following the first cycle of exposure.

American Foundrymen's Association

222 S. Adams Street, Chicago, Ill.

The 39th annual convention of the American Foundrymen's Association will be held at the Royal York Hotel, Toronto, Canada, August 20 to 23 inclusive. The meeting this year will be held without an exhibit, patterned after the successful technical meeting held in Chicago in 1927 at the Edgewater Beach Hotel. Work has already been begun on the formulation of the convention program.

The general committee is headed by **Major L. L. Anthes,** Anthes Foundry Ltd., Toronto. Special committees will cover Publicity, Transportation, Hotel and Entertainment, Golf and Plant Visits.

Chicago Chapter A. S. M.

1140 W. Washington Boulevard, Chicago, Ill.

The Chicago chapter of the American Society for Metals, held a meeting on April 11th, which marked the high spot in its career. Four hundred were accommodated at dinner and six hundred attended the entertainment and lecture.

Dr. R. M. Burns, assistant chemical director of the Bell Telephone Laboratories, New York, spoke on the protection of metals from corrosion, describing the process or mechanism of corrosion, the nature of corrosion resistant films, the protection afforded by zinc, cadmium, nickel, chromium and tin coatings, the principal protective organic coatings and the methods of corrosion testing.

American Zinc Institute

60 E. 42nd Street, New York

Howard I. Young has been elected president of the American Zinc Institute to succeed **Ralph M. Roosevelt. E. V. Gent** has been elected secretary to succeed **Julian D. Conover,** who resigned on January first to join the American Mining Congress.

The Institute elected five members to serve on the Code Authority of the Zinc Industry: **B. N. Zimmer, J. A. Robinson, J. R. Hobbins, J. E. Hayes** and **Ralph M. Roosevelt.**

Foundry Equipment Manufacturers' Association

1213 W. 3rd St., Cleveland, Ohio

Announcement is made by **Arthur J. Tuscany,** Executive Secretary of the Foundry Equipment Manufacturers' Association of the incorporation of the organization on the basis of a corporation not for profit.

Officers of the Foundry Equipment Manufacturers' Association, Inc. are as follows: **F. R. Wallace,** President; **R. S. Hammond,** Vice President; **Arthur J. Tuscany,** Treasurer and Executive Secretary.

Aluminum Manufacturers

1747 Graybar Building, New York

Kenneth G. Castleman has succeeded to the position of secretary of the Association of Manufacturers in the Aluminum Industry to fill the vacancy left by the resignation of **Donald McDonald.**

National Association of Purchasing Agents

11 Park Place, New York

The National Association of Purchasing Agents will hold their 20th Annual Convention and "Informashow" at the Hotel Waldorf-Astoria, May 20-23. The exhibits will include a wide variety of metal products and finishes. Among the exhibitors specializing in this field will be: Air Reduction Sales Company, American Brass Company, Wallace Barnes Company, Bridgeport Brass Company, Chase Brass and Copper Company, Dictaphone Sales Corporation, Joseph Dixon Crucible Company, Ediphone-Thomas A. Edison, Inc., Lunkenheimer Company, National Metal Edge Box Company, Pyrene Manufacturing Company, Riverside Metal Company, Scovill Manufacturing Company, Seymour Manufacturing Company, Walworth Company and Waterbury Button Company.

Speakers will be heard on various commodities including non-ferrous metals.

Personals

E. H. Dix, Jr.

E. H. Dix, Jr., Chief Metallurgist, Aluminum Research Laboratories, New Kensington, Pa., is secretary of American Society for Testing Materials Committee B-7 on Light Metals and Alloys, Cast and Wrought, for a term of two years. He is a graduate of Cornell University, with degrees of M.E. and M.M.E. Subsequently, he was instructor in the Materials Testing Department for several years. Later he was associated with the Baltimore Copper Smelting

E. H. DIX, JR.

and Rolling Company, Bureau of Aircraft Production and the Lynite Laboratories of the Aluminum Castings Company. At present, he is in charge of the metallurgical sections at Cleveland and New Kensington. In addition to his activities on Committee B-7, he is also a member of the following A.S.T.M. Committees: B-3 on Corrosion of Non-Ferrous Metals and Alloys, Sections on Compression Testing and Tension Testing of Committee E-1 on Methods of Testing, E-4 on Metallography, and B-6 on Die-Cast Metals and Alloys. He served as chairman of the special committee of B-7 which prepared the report recently issued by A.S.T.M. on "Service Characteristics of the Light Metals and Their Alloys."

Mr. Dix is Vice-Chairman of the Institute of Metals Division of the A.I.M.E.

N. W. Adsit has been elected treasurer of the New Jersey Zinc Company, 160 Front Street, New York, to succeed the late Henry S. Wardner. **F. P. Nolan,** associate counsel, has been appointed counsel, a post also held by Mr. Wardner before his death. Mr. Adsit had been assistant treasurer since 1927.

J. I. Baker has been elected president and general manager of the Safety Grinding Wheel Machine Company, Springfield, Ohio.

Charles L. Taylor, president of Taylor and Fenn Company, Hartford, Conn., has been elected a member of the board of Landers, Frary and Clark, New Britain, Conn.

Jacob Hay, who is well known to electroplaters through his activity in the American Electroplaters' Society, is handling buffs for the Wiliamsville Buff Manufacturing Company, Danielson, Conn., covering Illinois, Wisconsin and part of Indiana.

J. D. Wise, has resigned his position as executive secretary of the Foundry Equipment Manufacturers' Association, in Cleveland, and has taken the post of assistant to the president of the Pangborn Corporation, Hagerstown, Md.

Battelle Memorial Institute of scientific and industrial research, Columbus, Ohio, announces the appointment of **Dr. H. R. Nelson** as a member of the technical staff. Dr. Nelson will be in charge of a research project consisting of a study of the application of electron-diffraction methods to metallurgical problems.

M. A. Beckmann, who has been with the company since its inception and has risen to his present position of works manager, was elected a director, of **Aluminum Industries, Inc.,** manufacturer of Permite Products, at the annual meeting of stockholders, held in Cincinnati, March 25. Mr. Beckmann succeeds to the vacancy caused by the death of **H. J. Beck,** former vice president and assistant treasurer. **Judge T. Dixon** and **Howard N. Ragland,** leading Cincinnati attorneys, also were named to complete the board of nine, both filling vacancies.

G. F. Geiger and **R. E. Case** presented a joint paper, "Nickel Alloys in the Architectural Field," at the annual meeting of the American Chemical Society in New York, April 22-26. This paper dealt with the growing use of nickel silver, stainless steel and Monel Metal in the building industry.

George H. Ralls has resigned as director of sales of the parts division of the Chrysler Corporation to become president of Pressure Castings, Inc., of Cleveland. Mr. Ralls has been prominent in the parts manufacturing business for many years. He was long identified with the Gabriel Company, manufacturers of hydraulic shock absorbers, where he was president for many years prior to his association with the parts division of the Chrysler Corporation.

Clyde E. Williams, Director of Battelle Memorial Institute, Columbus, Ohio, announces the appointment of **Charles L. Faust** as Electro Chemist on the technical staff. Dr. Faust is a graduate of Washington University and received his Ph.D. degree in chemical engineering in June, 1934, from the University of Minnesota, having specialized in electrodeposition of alloys.

H. B. Rathbun, formerly with French Manufacturing Company, division of American Brass Company, Waterbury, Conn., has joined MacDermid, Inc., Waterbury, Conn., in capacity of vice president and chemical director. Mr. Rathbun is a graduate of Yale and a research chemist.

N. W. Pickering, president of Farrel-Birmingham Company, Inc., Ansonia, Conn., and Buffalo, N. Y., sailed on the Brittanic on April 8th for a two months' trip which will take him to a number of countries of Europe. The trip is one combining business with vacation and Mr. Pickering will spend some time with the company's representatives in England, France, Sweden and Norway. He also will visit Germany and Italy. Mrs. Pickering accompanied her husband to England, where she will visit with relatives. They expect to return home late in June.

Obituaries

C. D. Armstrong

C. D. Armstrong, formerly president of the Armstrong Cork Company, died early in April, at his home in Lancaster, Pa.

John Thorson Seaman

John Thorson Seaman, president and general manager of the Sea-Thor Brass Foundry Company, Milwaukee, Wis., died March 13 of injuries received in an automobile accident. Mr. Seaman was 58 years old.

Charles William Henger

In our March issue, on page 108 we published a note of the death of Mr. Charles W. Henger.

Mr. Henger passed away on February 13th, after an illness of about 30 days. He was born in St. Louis, Missouri, on November 2, 1858 and for many years was associated with one of the large machinery manufacturers, making harvesting machinery.

About 1900 he became associated with what was then the Waterbury Manufacturing Company of Waterbury, Conn., in charge of their Middle West territory and was called to Waterbury to become general manager of that concern and later to become a director and vice-president of the Chase Company of Waterbury.

He retired in 1925 and in the past ten years was not active but spent his time between Pasadena, where some of his children live, and the East, where other children live.

He started in the brass business from the merchandising end, later getting into the manufacturing end, so that he had a very wide knowledge of all the ramifications of this technical industry. He

CHARLES W. HENGER

saw the development of many processes that were revolutionary and that today are accepted as ordinary things by the present generation. He was one of the grand old men of the brass industry and was known from coast to coast by users of that material. His advice was always sound.

George W. Cooper

George W. Cooper, who was for a number of years, advertising manager of The **Metal Industry,** died on April 2nd, in London, Ontario, Canada, at the age

GEORGE W. COOPER

of 62. Mr. Cooper gained his early experience after leaving school, in newspaper work. He was subsequently engaged in bridge engineering and concrete mixer manufacturing. Upon meeting the late Frank B. Gilbreth, the internationally known industrial engineer, who was at that time a contracting engineer, Mr. Cooper went with him as publicity manager.

Mr. Cooper came to The **Metal Industry** as Advertising Manager in 1908, remaining with this organization for 16 years. In 1924, he resigned to establish The Glass Industry from which he retired several years ago.

He was a kindly, sincere and unassuming man, remembered by his associates with lasting affection.

Edgar F. Price

Edgar F. Price, vice-president, Union Carbide and Carbon Corporation, died on April 15 at his home in Port Chester, N. Y., at 62 years of age.

Mr. Price, became connected with the Willson Aluminum Company in 1891. The successors of this company formed the nucleus of the Union Carbide and Carbon Corporation. It was in one of their experiments in search of a method of producing aluminum that they accidentally produced the inflammable gas, acetylene.

Mr. Price's career with his company included the post of presidency of the Union Carbide Company and executive head of the Electro Metallurgical Company. At the time of his retirement in 1925, he was vice-president of the Union Carbide and Carbon Corporation, which had been established in 1917, and also an officer and director of some of the subsidiaries.

Clifford R. Gardinor

Clifford R. Gardinor, 60, president of the International Silver Company, died in Meriden, April 6 after undergoing a gall bladder operation. He was born in Jersey City Heights, N. J. and came to Meriden 25 years ago as purchasing agent. He was appointed assistant to the president, George H. Wilcox, and when the latter was named chairman of the board, Mr. Gardinor became president.

He attended the public schools in Newark, N. J. and was connected with the Westinghouse Electric Co., the National Cash Register Co. and the Columbia Graphaphone Co. before coming to Meriden.

He was a member of Masonic bodies, a trustee of the First Congregational church, president of the Home Finance & Mortgage Co., trustee of the Meriden Trust & Safe Deposit Co., director of the Home National bank, former president of the Highland Country club, former president of the Meriden Manufacturers association and the Chamber of Commerce and a director of the Connecticut Manufacturers association.

He leaves his wife, Laura Grabenstein Gardinor; a daughter, Mrs. Henrie Prunaret of Wellesley, Mass., and a brother, Frank F. Gardinor of Trenton, N. J. The funeral was held in Meriden April 9.

W. R. B.

Maynard Stuart Melville

Maynard Stuart Melville, Works Manager of the Benedict Manufacturing Company, East Syracuse, N. Y., died April 25th at his home in Dewitt, N. Y.

He was born fifty-three years ago at Ballston Spa, N Y. and was a nephew of the late Maynard S. Benedict, founder of the Benedict Manufacturing Company in 1895.

Following his graduation in Engineering at Cornell University in 1912, Mr. Melville became head of the Cost Department of the Benedict Company, holding that position until 1917 when he became connected with Oneida Community Ltd., in research work. In 1931, he returned to the Benedict Manufacturing Company, as Factory Manager.

Mr. Melville was a most capable manager and executive and held in high esteem by every one who knew him.

He is survived by his wife, two sons, and father.

Corporation Earnings

Net profit unless followed by (L) which is loss.

	1934	1933
Acme Wire Company	$34,344	$6,985
Aluminum Company of America	6,466,149	1,664,547
Aluminium Ltd.	100,467	130,806
American Chain Company	491,875	431,000 (L)
American Metal Company (First Quarter)	73,359	183,766 (L)
Anaconda Wire and Cable Company	821,801	213,872 (L)
Anaconda Wire & Cable Cable Co. (First Quarter)	216,266	126,304
Art Metal Works, Inc.	200,938	22,326
Bohn Aluminum & Brass Corporation (First Quarter)	554,613	649,953
Bridgeport Brass Company (First Quarter)	186,906	114,761
British Aluminium Company	£170,192	£110,850
Canada Wire & Cable Company, Ltd.	6,636	4,398
Cleveland Graphite Bronze Company	510,803	377,162
Cleveland Graphite Bronze Company (First Quarter)	547,917	215,827
Driver Harris Company	138,806	132,581
Doehler Die Casting Company	460,550	232,933
E. I. du Pont de Nemours & Company (First Quarter)	11,097,142	11,628,154
Electric Boat Company	339,948	38,185
General Cable Corporation	126,318 (L)	329,796 (L)
International Silver Company (First Quarter)	341,477	56,794
Kennecot Copper Corporation	5,719,854	2,444,706
Parker Rust Proof Company (First Quarter)	317,507	280,816
Revere Copper & Brass, Inc. (First Quarter)	390,342	417,015
Savage Arms Corporation	66,930 (L)	82,336 (L)
Union Metal Manufacturing Company	74,657 (L)	79,307 (L)
Wolverine Tube Company	131,109	48,358

Industrial and Financial News

Metal Developments

In the daily press recently it was pointed out that more aluminum was produced at the Massena, N. Y., plant of the **Aluminum Company of America** than any other entire nation in the world except Germany. Production in 1934 was about 18,000 tons, about 54 per cent of the entire American output.

Marks Coffee Company of Augusta, Ga., recently adopted a flexible metal bag for packing their product. This bag is of Reynolds metal, manufactured by the **Reynolds Metals Company,** 19 Rector Street, New York City. Incidentally the Reynolds company has issued 50,000 shares of $100 par value, convertible, 5½% preferred stock to provide additional capital for the development of promising new outlets for their metal foil.

Edward J. Cornish, chairman of the **National Lead Company,** reported to the stockholders that their business in the first quarter of 1935 was the best for any similar period since 1930. At the same time it was behind the average of the past eight years.

The Diesel engine used to power the **New Haven "Comet,"** one of the new "all-aluminum" trains, uses non-ferrous metals in a number of its parts, such as permanent mold aluminum castings for the pistons, satin finished aluminum hardware, aluminum cylinder heads, bronze bushings at the top ends of the connecting rods, and bronze shells in halves, for the large end of the connecting rods, babbitted with a lead base alloy.

According to a report of the **Research and Planning Division of the N. R. A.,** the **Aluminum Company of America** controls the distribution of from 90 to 95 per cent of the imports and domestic production of high grade bauxite ores, produces 100 per cent of the alumina and has 100 per cent of the virgin aluminum ingot capacity of the United States. This report was made in connection with a complaint against the Aluminum Company by independent fabricators who claim that the company squeezes them by holding the price of virgin aluminum at high levels and taking no profit or even a loss on its own fabricated production. No definite findings have yet been reported on this point by the N. R. A.

John Wanamaker Department Store in New York has placed on exhibition a pre-fabricated house made of metal, cement and asbestos, manufactured by American Houses, Inc. Most of the metal used is steel, but the exterior trim is of a special aluminum alloy.

W. J. Buttfield, president of the **Vulcan Detinning Company,** Sewaren, N. J., reports the successful recovery of pig tin from tin-bearing waste materials by novel methods. Increased operations depend upon the obtaining of increased supplies of raw materials.

Gold, silver and **platinum** are contained in ordinary coal ashes, according to a paper presented at the annual meeting of the American Chemical Society, held in New York, April 26th, by Prof. V. M. Goldschmidt of the University of Gottingen, Germany. The value of these and other metals, such as germanium and rhodium, amounts to a few cents "per ash can."

Business Items-Verified

Detroit Electric Furnace Company, Detroit, Mich., announces recepit of an order from Fiat Motor of Torino, Italy, covering a thousand-pound Detroit rocking electric furnace for use in Fiat's brass foundry. This is the second Detroit rocking electric furnace purchased by Fiat.

Lea Manufacturing Company, Waterbury, Conn., specialists in the manufacture of buffing and polishing compounds, announces the addition of two well-known research men to its technical staff, George C. Muscio, chemical engineer formerly with Hanson-Van Winkle-Munning Co., and Dr. H. L. Kellner, formerly with Sterling Laboratories, New Haven, Conn. They will devote most of their time to research work in connection with polishing, buffing and electroplating problems and to the development of new products. The Lea Manufacturing Company has greatly enlarged its laboratory for this purpose and will be glad to co-operate with the trade on any of its problems.

Mueller Brass Company, Port Huron, Mich., reports that they have absolutely no connection whatever with the Auto-Lite Company, Toledo, Ohio.

Keeler Brass Company, Grand Rapids, Mich., manufacturer of brass castings, hardware products and kindred metal specialties, has acquired former factory of **Standardized Furniture Company,** totalling about 44,000 sq. ft. floor space, adjoining their factory. Plans for use of this property are to be determined later.

The **McGean Chemical Company** has moved its office to 1106 Medical Arts Building, Terminal Group, 25 Prospect Avenue, N. W., Cleveland, Ohio.

Royal Metal Manufacturing Company, 1140 South Michigan Avenue, Chicago, Ill., manufacturer of metal chairs and other metal furniture, has leased space in the building at 91 Church Street, Toronto, Can., for a new branch assembling and finishing plant for Canadian trade.

Wilson and Bennett Manufacturing Company, Chicago Ill., has acquired accounts, patents and good will of the Ohio Pail Company of Middlefield, Ohio. Engaged in the manufacture of pails since 1895, the company is said to be one of the largest industries of its kind in the country. Under the new management, pails will be manufactured in Chicago and shipped to Middlefield plant for distribution.

Wolverine Tube Company, Detroit, Mich., has opened a mill distributing depot at 229 North 12th Street, Philadelphia, Pa., where they carry brass and copper pipe, copper water service tubing, refrigeration tubing, automotive tubing and aluminum tubing.

Vulcan Stamping and Manufacturing Company, 4036 W. Lake Street, Chicago, Ill., manufacturer of metal containers, cans, pails, etc., has purchased a one-story factory in the Bellwood district. The firm manufactures a complete line of steel containers of both the permanent and removable cover styles, in plain, enameled and lithographed finishes.

The **Boston** office of **Revere Copper and Brass, Inc.,** is now located at 138-164 Federal Street.

Acme Porcelain Enameling Corporation announces the completion of its new plant at 1181-1187 Randall Avenue, corner 156th Street, Bronx, N. Y. Officers are: President, **Jack Freizer; Jack Sorkin,** treasurer; **Ross Nelson,** plant manager.

New Incorporations

Girard Manufacturing Company, Girard, Pa., has been chartered with a capital of $300,000, to engage in the manufacture of electrical and other metal toys. Principals are: L. Marx, New York City; S. B. Gunnison, 2700 Elmwood Avenue, Erie, Pa., and D. H. Marx, New York City. The following departments are operated: tool room, stamping.

White Electric and Manufacturing Company, 632 Clifford Street, Lansing, Mich., has been organized to manufacture electric water heaters and kindred products by Clay Campbell, Olds Tower Building, and associates. The firm operates the following departments: tool room, stamping, soldering, brazing, lacquering and japanning.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

May 1, 1935.

Officers of the **American Brass Company** were reelected at the annual meetting last month as follows: President, John **A. Coe**; Vice President, Secretary and Treasurer, **Clifford A. Hollister**; Vice President, **Clark S. Judd**; Assistant Treasurers, **Major W. Judge** and **S. Burnham Terry**; Assistant Treasurer and Assistant Secretary, **Edwin J. Rockwell.**

They were elected by the directors who were reelected at a preceding meeting of the stockholders, the directors elected being: **Cornelius F. Kelley, John A. Coe, Clifford A. Hollister, Clark S. Judd, Franklin E. Weaver, James R. Hobbins** and **Robert E. Dwyer.**

Scovill Manufacturing Company stockholders last month reelected the following directors: **Edward O. Goss, John H. Goss, Leavenworth P. Sperry, Chauncey P. Goss, William S. Fulton, George A. Goss, Roger S. Sperry, William M. Goss, H. Lamson Scovill, William T. Hunter, Francis T. Ward** and **Austin L. Adams.** The directors will meet this month to elect officers.

Reorganization of the **Beardsley & Wolcott Manufacturing Company** under the terms of the new federal bankruptcy act has now been completed. It has received $85,000 from the RFC and $25,000 from a second mortgage. As a result **Lyall Brown**, trustee, expects that the number of employes will soon be increased from 150 to 400. The city's claim for taxes is still unsettled as the company holds the assessment is too high. At a Federal Court Hearing last month real estate appraisers testified that the value of the land and buildings had dropped from $124,000 in 1930 to $84,000 now, due to decrease in the costs of building and depreciation. The city has a claim for $42,000 for back taxes.

W. R. B.

Connecticut Notes

May 1, 1935.

NEW BRITAIN — The **American Hardware Corporation** directors at their annual meeting last month declared dividends for the year at 25 cents per share per quarter, beginning April 15. **John S. Black** was elected to succeed **George P. Spear** as director. Other directors and officers were reelected.

Dividends for the year at the rate of 37½ cents per share per quarter were voted at the annual meeting of **Landers, Frary & Clark** last month, beginning April 1. **Charles L. Taylor** was elected to succeed **Lucius Barbour,** recently deceased, as a director. Other directors and officers were reelected.

The **Hart & Cooley Company,** holding company of the various Hart & Cooley factories, last month declared a quarterly dividend of $1.12½ a share, payable April 15. All directors and officers were reelected. The annual statement for last year shows a gain in assets from $1,996,000 to $3,303,000 and a gain in surplus from $746,505 to $2,000,500 as compared with the former year. One of its subsidiaries, the **Fafnir Bearing Company,** carries its investments, less reserves, at $1,133,000 compared with $1,503,000 the previous year.

The **North & Judd Manufacturing Company** paid its regular quarterly dividend of 25 cents a share on April 1.

Carl S. Neumann was reelected president of the Union Manufacturing Company. All other officers and directors were reelected.

The **Goss & DeLeeuw Machine Company** of Kensington, a suburb of New Britain, last month elected **Richard L. White** as treasurer. He is also treasurer of **Landers, Frary & Clark.**

BRIDGEPORT — The **Bridgeport Brass Corporation** has applied to the New York Stock Exchange for the listing of 678,680 shares of the company stock.

The **Bridgeport Manufacturing Association** reports that employment last month was the highest since October, 1930, the number employed in the 30 largest plants being 13,854.

The **General Electric Company** engineers at the local plant are developing a new line of radios. When production starts it is expected the employes of the radio division will increase from 500 to 700 or 800.

The **Jenkins Valve Company** is operating with a maximum working force, according to Vice President **B. J. Lee,** and is running 35 per cent ahead of 1934.

HARTFORD—The **Standard Screw Company** paid the regular quarterly dividend of $1 on April 1.

STAMFORD—**Yale & Towne Manufacturing Company** reports that **Maxwell C. Maxwell,** former works manager, has been appointed special assistant to President **W. Gibson Carey,** and **Richard G. Plumley,** production manager, has been named works manager. Business at the plant is improving and employes who were allowed only one week vacation with pay in recent years will be given two weeks this year.

MERIDEN — The **New Departure Manufacturing Company** plant here employed 1,654 in March which was within 32 of the peak number in March, 1929. Payrolls increased five per cent from February to March and the total is now 92 per cent of the peak in 1929. The rate of pay now is higher but the number of man hours per man is less.

WINSTED — The **Winsted Clock Corporation** has granted 5 per cent wage increases to employes whose wages were not adjusted to the clock and watchmakers' code, which became effective March 18.

TERRYVILLE — The **Eagle Lock Company** paid the regular quarterly dividend of 25 cents a share on April 1.

PLAINVILLE—The **Trumbull Electric Manufacturing Company** employes, last month, were paid a bonus of 5 per cent of their earnings during the first quarter.

NEW HAVEN — **Edwin P. Root,** chairman of the board of the **New Haven Clock Company** retired after 60 years' service. He was succeeded by **Richard S. Whitehead.** Mr. Root continues as a director. **George A. Whitney** resigned as vice president and purchasing agent. **Frederick A. Neumann** was appointed as purchasing agent.

BRISTOL—The Board of Relief, in answer to protests, has made substantial reductions in the assessments of three local factories. The **Sessions Clock Company's** assessment was reduced almost $200,000; that of the **American Silver Company** about $100,000 and that of the **Wallace Barnes Company,** $10,000. The **Sessions Clock Company** obtained a large government loan last fall in order to increase its operations.

Providence, R. I.

May 1, 1935.

Announcement was made early the past month that United States Senator **Jesse H. Metcalf** of Rhode Island had made a gift of $50,000 for the maintenance of the Metcalf Chemical Laboratory at Brown University this city, which was erected and equipped by the Senator.

Among the bills passed by the lower branch of the Rhode Island General Assembly the other day was one which would prohibit the employment of women and minors in any industry at night and restrict women's work to 48 hours and children's to 40 hours a week. The bill would also compel a five-day week for women in industry.

The **Eppley Laboratories,** manufacturers of delicate electrical measuring instruments, have received an order for instruments for the Soviet Government of Russia that is said to run into many thousand dollars.

Stockholders of the **Gorham Manufacturing Company** at the annual meeting the past month elected the following directors: **Henry J. Fuller,** chairman; **Edward B. Aldrich, Witherbee Black, Walter L. Clark, G. Maurice Congdon, Russell Grinnell, Edmund C. Mayo, Alfred K. Potter, William A. Viall** and **Wilfred L. Wright.** Following the stockholders' session, the directors named the following officers: President —**Edmund C. Mayo**; Vice President and Treasurer—**Alfred K. Potter**; Vice Presi-

dent — **John B. Abbott**; Secretary — **Hiram C. Hoyt**; Assistant Treasurer—**Lester F. Morse**; Assistant Treasurer and Assistant Secretary—**Albert A. Wainwright**.

Armando F. Cianfaranti and **Edgardo F. Cianfaranti** have filed statements with the City Clerk's office, that they are the owners of the **Novo Findings Company**, 185 Eddy Street.

Carl J. Abelson, for a number of years superintendent of the jewelers' findings manufactory of **T. W. Lind Company**, died at the Charles V. Chapin Hospital, this city on March 21 from pneumonia. He was in his 48th year and leaves a widow and two children. He was born in Sweden and come to Providence 32 years ago.

E. F. Burke, of **C. I. Hayes, Inc.**, manufacturers of electric furnaces, this city, has been elected a member of the executive committee of the American Society for Metals.

T. W. Lind Company, manufacturers of jewelers' findings and metal trimmings, ornaments and novelties of this city has appointed the **H. J. Sanders Brass Fittings Company**, 27 South Desplaines Street, Chicago, as its representative in that territory.

Warwick Brass Machine Company, Inc. of Warwick, has filed notice with the Secretary of State's office that its name has been changed to **Warwick Corporation.**

Alfred Marsland, who has been associated with the **T. W. Lind Company** for more than twenty years, has been appointed superintendent.

Twenty-eight concerns in the manufacturing jewelry industry reported 4,947 employees at the close of March, which was a falling off of 0.8 per cent from February and of 5.6 per cent from March, 1934. In the metal trades 37 concerns reported 8,013 employees, a gain of 2.3 per cent over the preceding month and of 8.7 per cent as compared with March, 1934. W. H. M.

Middle Atlantic States

Utica, N. Y.

May 1, 1935.

A better business tone is being noted in Central New York and particularly in Utica according to reports issued by the Utica Chamber of Commerce for the first quarter of 1935.

The **American Emblem Company**, Utica, among its other products is making a large quantity of convention badges.

Increased working hours are reported at the **Emil Steinhorst & Sons, Inc.**, manufacturers of metal products, who are now making an electric milk cooler for the farm trade with a metal cabinet and a set of copper piping.

A sales meeting of the **International Heater Company** representatives in Eastern United States was conducted at the factory in Utica when it was announced that **Jules Danquer**, company president, had resigned. No successor had been named late in April. **L. R. Taylor**, vice-president, was in charge of the sales conference. Mr. Taylor said a new line of air-conditioning apparatus will be announced to the public very soon.

The **Bossert Corporation**, Utica, makers of metal stampings have filed a petition in Federal Court here to reorganize under the 77B section of the federal statutes. The petition has been approved.

Officials of the **Oneida Ltd.**, one of the largest makers of silver plated hollow ware and flat ware in the country are watching with alarm the mounting price of silver. Boost in prices is inevitable, they believe. The market has not yet reached the point, however, officials say when a change in prices must be made.

The plant located at Sherrill is working night and day seven days a week with more than 500 new employes added since late winter. Four shifts are working in some departments. Shipments are heavy and the boom has taken many off the relief rolls in Oneida and neighboring towns. E. K. B.

Newark, N. J.

May 1, 1935.

Wheelock, Lovejoy & Company, Inc., of Cambridge, Mass., have leased a plant at 326 Frelinghuysen Avenue, Newark, for the warehousing and distributing of alloy and steel products. The concern will return here after an absence of several years. A plan for reorganization of **J. Steinberg & Sons**, sheet metal works, 740 Frelinghuysen Avenue, has been submitted to Federal Judge Fake by counsel for the concern. The plan provides stockholders shall receive stock in the new company, general creditors will receive 40 per cent of their claims and priority claims will be paid in full.

Eastern Industries, Inc., manufacturers of dry chemicals, have leased an industrial building at Harrison, N. J., to be used as a warehouse.

Under a reorganization order signed by Federal Judge Fake, the **Bond Electric Company** of Jersey City, has taken back its business and is continuing employment of more than 500 employes. The company was organized in 1902, and since June, 1934, had been operated by three trustees. Under the present order, present holders of bonds and creditors will receive 4 per cent debenture bonds, maturing in 15 years. The company manufactures flashlights and batteries. C. A. L.

Trenton, N. J.

May 1, 1935.

The **Bartley Crucible and Refractories Company**, Trenton, N. J., is planning to reorganize the concern and start the factory on a paying basis again. **Nathan Lane**, of Riverton, N. J., met with counsel to perfect a reorganization. The company was formerly known as the **Jonathan Bartley Crucible Company.**

Following concerns have been incorporated here: **Metal Reduction Company of New Jersey**, Jersey City, metal products, $125,000; **Mueck-Cary Company, Inc.**, Bound Brook, silverware, $40,000; **Victor's of Passaic, Inc.**, Passaic, manufacturing jewelry, 1,000 shares no par; **Reade Manufacturing Company, Inc.**, Jersey City, chemicals, 500 shares no par; **Quality Vacuum Products Corporation**, East Orange, chemical apparatus, 2,500 shares no par. C. A. L.

Middle Western States

Toledo, Ohio

May 1, 1935.

Industrial conditions have steadily progressed here during the last several weeks. Motor car accessory plants are the most active and now are producing well up to capacity. It is predicted among industrialists here that present conditions probably will prevail for many months.

The plating plants have not been so busy in years as they are now. While the motor car demands are heavy, Toledo has a wide range of other lines outside this field that are making gratifying advances.

Alfred G. Gulliver, Flint, Mich., has been made general manager of the Chevrolet Motor Car Company's branch plant in Toledo, it is announced. He formerly was general superintendent of Chevrolet operations in Flint.

According to the Toledo Blade, hope is expressed for the reorganization of the **Willys-Overland Company** through the formation of a new company with probably a capital of about $10,000,000.

R. F. Black has been chosen president of the **White Motor Company**, it was announced in Cleveland on April 17. Mr. Black formerly was president of the **Brockway Motor Truck Corporation**, of Cortland, N. Y. The White is one of the older units in the automotive industry specializing in the manufacture of commercial motor vehicles. The plant is now working to capacity, it is stated.—F. J. H.

Detroit, Mich.

May 1, 1935.

Industrial conditions in Detroit and out-state have steadily improved during the last month, production probably being the highest since before 1929.

The most outstanding advances have been in the motor car field where most of the big plants are working nearly to capacity. This, of course, is reflected back to accessory manufacturers who are producing incessantly in order to

keep up with demands of car makers.

Extensive operations in the motor field now seem assured for well along into the summer, with the possibility of the momentum carrying the industry still farther.

The plating industry is meeting with heavy demands and practically all the plants are working full time.

Manufacturers of refrigeration units are going at the same old pace—heavy production from one week to another. Favorable reports also come from manufacturers of vacuum cleaners, with activities that probably will extend through most of the summer.

It might be well to broadcast the fact that there still is little chance here for absorbing outside labor. Although industry is active, there are plenty of local unemployed men eagerly awaiting a chance to work.

"A wider range of bearing alloys than ever before in the history of the motor car industry, is now available," states **W. E. McCullough**, chief metallurgist of the **Bohn Aluminum & Brass Corporation**, here in Detroit. Furthermore the number is steadily increasing, particularly since the introduction of metals other than babbitt. The rapid increase in engine speeds and horsepower during the last few years has pushed development ahead rapidly. While it may be stated that bearings available today are superior to anything that has been previously produced, the whole situation is still in a state of flux and it is possible that within reasonable time we will be able to announce the perfection of new bearing alloys of even higher capabilities."

William T. Barbour, formerly president, has been made chairman of the board of directors of the **Detroit-Michigan Stove Company**, and **John A. Fry**, formerly vice president, has been made president. "In addition to the marked increase in our business," Mr. Barbour announces, "we expect additional new business to be developed in cooking and heating equipment due to activities of the Federal Housing Administration and other government agencies in releasing credit for home building and improvements. We are confident that the net results of the fiscal year, ending in June, will be most satisfactory."

Arrangements have been completed by the **Detroit Electric Furnace Company**, with the **Birmingham Electric Furnace Company**, of Birmingham, England, for the manufacture and sale in Great Britain, the British Empire and certain other European countries, of the Detroit company's rocking electric furnaces under the name of **Birlec Detroit Rocking Furnaces**. "Birlec" is a name well known in the field of heat treatment in England. The rocking indirect arc furnace is used both here and abroad for brass, iron and alloy steels.

The **Norge Corporation**, manufacturers of refrigeration units, has an all-time record employment in its Muskegon Heights, Mich., plant, of 2,700 persons.

John A. Callahan, for a number of years identified with the **Briggs Manufacturing Company**, has been appointed to take charge of operations of the organization's new plumbing division, it is announced by **W. P. Brown**, general manager. **Mr. Callahan** has directed the company's development work in plumbing for some time and has had a wide training in both the manufacturing and selling fields.

Chicago, Illinois

May 1, 1935.

The general trend of the metal industry in Chicago is one of increased production, re-employment, and an optimistic air since the beginning of the year. Many companies have voiced the strong belief that business should be better this year, due to the large amount of government spending in construction work. Comparison of the present output with former years is most encouraging.

The **Delta-Star Electric Company**, metal foundry, was the recent successful bidder on the contract for work on the Boulder Dam project. This company will furnish the largest high tension switches ever built in the world for this project, including power switches for the transit line from the dam to the city of Los Angeles; and also high-conductivity copper castings for use with the metal-clad switch gear to be installed in the power house at Boulder Dam, proper. The foundry has only recently completed the manufacture of these high-strength bronze castings.

Increase in the business of the **Acme Aluminum Foundry Company** has warranted running night and day shifts, employing 150 people, where before they used about half that number, according to **A. J. McIlvenny**, secretary of the firm.

Present business in the **A. Meskan Chandelier Foundry Company** is 100 per cent better than three or four months ago, according to **William Meskan**, manager of the organization, although the company's business is 80 per cent less than in 1927.

The **Paragon Die Casting Company** reports that their firm is very busy, running two shifts at the present time.

The **Hills McCanna Company**, manufacturers of mechanical equipment for the oil and chemical industries, report a 20 per cent increase for the first quarter of the year 1935 over the first quarter of 1934.

The last two weeks have been the busiest of this year, says **Joe Henderson**, part-owner and manager of the **Advance Plating Company**, who specializes in chromium plating.

The **West Side Plating Company**, formerly located at Forest Park, Illinois, has recently moved to new and larger quarters in Chicago, and is now located at 2240 West Ogden Avenue, since about the beginning of the year. **W. F. O'Rourke**, manager, reports business as steady.—R. G. K.

Pacific States

Los Angeles, Calif.

May 1, 1935.

The **Kelman Electric and Manufacturing Company**, 1650 Naud Street, have the contract for fifteen of the largest disconnecting switches in the world, for the 270 mile power transmission line for Hoover Dam. They weigh 15 tons each, 287,000 volts each, operated by hand or push button. There will be three blades to a switch, 26 feet between blades, mounted on porcelain insulators 28 feet in height. The blades are 15 feet in length, made of copper and brass. They were made by the **Anaconda Copper Company**.

Dr. Hiram W. Edwards of the University of California at Los Angeles, has developed a new mirror and reflector, the Panchro Process, much better than the silver or aluminum, made of an alloy of magnesium and aluminum, as durable as chromium.

G. W. Kyle and **M. D. Rynkofs** of the **Liberty Electroplating Company** of 1350 West 25th Street, have developed the complete and lost art of mummifying bodies and a coating is used that looks like a metallic substance.

Frank P. Baldi, metallurgist of 321 West 3rd Street, has developed a new process for the extraction of aluminum at a lower cost than formerly.

The **U. S. Spring & Bumper Company** are now working on the $100,000 enlargement to their factory. **John B. Rauen**, president and general manager.
—H. S.

The North Pacific

May 1, 1935.

The **Reynolds Metal Products Company** of 345 9th Street, San Francisco, are improving their factory.

The **Puget Sound Sheet Metal Works** at Seattle, are working 24 hours a day, three forces.

The **American Gas Machine Company** of Oakland, are making a new gasoline pressure stove.

The **Spencer Manufacturing Company** of 8410 Dallas Avenue, Seattle, are making a new spray sprinkler.

The **Universal Lawn Tool Company** of 1406 Water Avenue, S.E., Portland, are producing a new lawn water spray.

The **Merco Nordstrom Valve Company**, 2431 Peralta Avenue, Oakland, are making a new line of lubricating plug valves.

The **Universal Form Clamp Company** of Chicago, will open their Pacific factory and warehouse, at 130 Hooper Street, San Francisco, in charge of **MacGregor S. Anderson**.

The **Druge Brothers Manufacturing Company** of Oakland, are making a new all metal swivel spout faucet for water or oil uses. H. S.

Metal Market Review

May 1, 1935.

Copper remained unchanged at 9c for electrolytic, Blue Eagle. However, there was no lack of interest in the market. The group of foreign producers who met in New York late last month, came to an understanding with the result that foreign copper strengthened visibly with active buying. This strength continued throughout the first two weeks, and although the demand quieted down toward the latter part of the month, the outlook was encouraging.

Zinc was firm to strong, it began at 3.90, Prime Western, St. Louis and rose to 4.00. Toward the latter part of the month, consumers entered the market for large quantities and quotations rose to 4.10 E. St. Louis.

Tin recovered from its sinking spell of the past month, rising from 47.85 to as high as 51.25 and closing at 50.80. The domestic demand slackened off somewhat with the rise of price, with occasional spurts, undoubtedly because of present needs. The latter part of the month was fairly quiet.

An interesting development was a report from Sub-Committee of the House Committee on Foreign Affairs in Washington, which recommended the establishment of a tin-smelting industry in this country, an exhaustive search for tin ores in the United States and systematic research for substitutes for tin.

Lead was firm to strong beginning the month at 3.50 and ending at 3.60. Demand from the pigment industries was good, backed up by fair distribution among sheet lead and pipe manufacturers and battery makers. It seems to be the feeling of producers that the consumption of lead is expanding.

Aluminum remained fixed at 22c. American production in 1934 amounted to 74,177,000 lbs. valued at $14,094,000, as compared with 85,126,000, valued at $16,174,000 in 1933. German production almost doubled, to 37,158 metric tons, passing American output, 33,646. Russian output rose from 4,400 to 14,400.

Nickel was unmoved at 35c.

Antimony was strong at the beginning, 14.50 to 14.60, but slipped to 14.25 with the market rather dull.

Silver was the star performer among the cut-ups. It began the month at 61.25. After a few days rest at this point, it began to climb, not slowly but by tremendous leaps, reaching a maximum of over 81c per ounce. The rise in the open market prices forced the Administration to take action in revising the basis for the purchase of newly-mined domestic metal. On April 10th, by Presidential proclamation, the Government price was set at 71.11, but the continued rise in the open market forced another Government advance to 77.57. It was probably expected by the speculators that the Government would follow the continued rise with another boost, but strangely enough the Treasury took no action whereupon silver reacted from the top of 81c to 75.75.

At this time the market is decidedly nervous. The Treasury is absolutely silent about its plans. It is in a measure pledged to follow the market in order to buy up enough silver to bring the metallic reserves of this country up to one-third the quantity of gold. On the other hand, following this policy without deviation, practically puts them in the hands of the speculators who are driving the metal ahead with the expectation that the Government price will have to follow.

Platinum remained unchanged at $31.00 per ounce.

Gold remained unchanged at $35.00 per ounce.

Scrap Metals teetered back and forth within narrow limits. Early in the month, refiners' bids for copper base material were up about 5 points. Later they advanced from 5 to 10 points more. Shortly after the middle of the month, bids were reduced from 5 to 15 points, due to needs being filled and also to large offerings and lower prices abroad. The net result was a slight rise. Aluminum scrap was fairly firm throughout as were also lead and tin.

A break occurred in the ingot market when several of the leading producers of copper, brass and bronze ingots followed an important producer and filed lower quotations with the Code Authority.

The Code Authority reported that shipments of the 41 companies engaged in that industry during the month of February amounted to 4,959 tons.

Non-Ferrous Ingot Metal Institute reports the average prices per pound during the twenty-eight day period ending April 19, as follows:

Commercial 80-10-10 (1½% Impurities)	9.625c
Commercial 78% Metal	7.334c
Commercial 81% Metal	7.707c
Commercial 83% Metal	7.796c
Commercial 85-5-5-5	8.110c
Commercial No. 1 Yellow Brass Ingot	6.416c

WROUGHT METAL MARKET

The market for sheet and fabricated material held at fairly satisfactory levels. There was a slight tapering off in the early part of the month, but it recovered shortly afterward, due perhaps to the continued activity in the automobile industries. The brass mills and wire interests continue to feel steady demand for their products. Distributors in the Metropolitan District reported an increase in business over March and also over April, 1934.

Daily Metal Prices for April, 1935

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	5	8	9	10	11	12	15	16	17
Copper c/lb. Duty 4 c/lb.													
Lake‡ (del. Conn. Producers' Prices)	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125
Electrolytic‡ (del. Conn. Producers' Prices)	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Casting (f.o.b. ref.)	7.60	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75
Zinc (f.o.b. East St. Louis) c/lb. Duty 1¾ c/lb.													
Prime Western (for Brass Special add 0.05)	3.90	3.90	3.90	3.90	3.90	4.00	4.00	4.00	4.00	4.05	4.10	4.10	4.10
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	47.85	47.95	48.40	49.45	49.50	49.45	49.375	49.625	51.00	51.25	51.00	51.125	50.75
Lead (f.o.b. St. L.) c/lb. Duty 2⅛ c/lb.	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.55	3.55	3.55
Aluminum c/lb. Duty 4 c/lb.	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Nickel c/lb. Duty 3 c/lb.													
Electrolytic 99.9%	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Antimony (Ch.99%) c/lb. Duty 2 c/lb.	14.50	14.60	14.60	14.25	14.25	14.25	14.25	14.25	14.25	14.25	14.25	14.25	14.25
Silver c/oz. Troy, Duty Free	61.25	61.25	61.25	61.50	61.75	62.625	63.00	64.125	65.75	68.50	68.25	67.25	67.00
Platinum $/oz. Troy, Duty Free	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00
Gold—Official Price¹ $/oz. Troy	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00

	18	19	22	23	24	25	26	29	30	High	Low	Aver.
Copper c/lb. Duty 4 c/lb.												
Lake‡ (del. Conn. Producers' Prices)	9.125	....	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125
Electrolytic‡ (del. Conn. Producers' Prices)	9.00	....	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Casting (f.o.b. ref.)	7.75	....	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.60	7.743
Zinc (f.o.b. East St. Louis) c/lb. Duty 1¾ c/lb.												
Prime Western (for Brass Special add 0.05)	4.10	....	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	3.90	4.029
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	50.625	....	50.75	50.80	50.875	50.75	50.50	50.375	50.80	51.25	47.85	50.105
Lead (f.o.b. St. L.) c/lb. Duty 2⅛ c/lb.	3.55	....	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.50	3.542
Aluminum c/lb. Duty 4 c/lb.	22.00	....	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Nickel c/lb. Duty 3 c/lb.												
Electrolytic 99.9%	35.00	....	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Antimony (Ch.99%) c/lb. Duty 2 c/lb.	14.25	....	14.25	14.25	24.25	14.25	14.25	14.25	14.25	14.60	14.25	14.295
Silver c/oz. Troy, Duty Free	67.625	....	67.625	69.875	71.625	77.00	81.00	75.75	75.75	81.00	61.25	67.788
Platinum $/oz. Troy, Duty Free	31.00	....	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00
Gold—Official Price¹ $/oz. Troy	35.00	....	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00

‡ Blue Eagle Copper. ¹ United States Treasury price.

Metal Prices, May 2, 1935

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

NEW METALS

Copper: Lake, 9.125, Electrolytic, 9.00, Casting, 8.00.
Zinc: Prime Western, 4.10. Brass Special, 4.20.
Tin: Straits, 50.55. Pig 99%, 49.00.
Lead: 3.60. **Aluminum,** 22.00. **Antimony,** 14.25.
Nickel: Shot, 36. Elec., 35.

Quicksilver: Flasks, 75 lbs., $73.00. **Bismuth,** $1.10.
Cadmium, 65: **Silver,** Troy oz., official price, N. Y., May 2, 71.25c. **Gold:** Oz. Troy, Official U. S. Treasury price, May 2, $35.00. **Scrap Gold,** 6¾c. per pennyweight per karat, dealers' quotation. **Platinum,** oz. Troy, $31.00.

Duties: Copper, 4c. lb.; zinc, 1¾c. lb.; tin, free, lead, 2⅛c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	U. S. Import Duty	Tax*
Brass Ingots, Yellow	6⅜ to 7⅞	None	4c. lb.[1]
Brass Ingots, Red	8 to 11	do	do
Bronze Ingots	9 to 12¼	do	do
Aluminum Casting Alloys	15½ to 22	4c. lb.	None
Manganese Bronze Castings	20 to 34	45% a. v.	3c. lb.[2]
Manganese Bronze Forgings	26 to 38	do	do
Manganese Bronze Ingots	9 to 13	do	4c. lb.[1]
Manganese Copper, 30%	11½ to 16	25% a. v.	3c. lb.[2]
Monel Metal Shot or Block	28	do	None
Phosphor Bronze Ingots	10 to 12	None	4c. lb.[1]
Phosphor Copper, guaranteed 15%	13¼ to 15	3c. lb.[2]	do
Phosphor Copper, guaranteed 10%	11½ to 14	do	do
Phosphor Tin, no guarantee	61 to 75	None	None
Silicon Copper, 10%	18 to 30	45% a. v.	4c. lb.[1]
Iridium Platinum, 5%	$32.—	None	None
Iridium Platinum, 10%	$33.—	None	None

*Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1]On copper content. [2]On total weight. "a. v." means ad valorem.

OLD METALS

Dealers' buying prices, wholesale quantities:

	Cents lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	6⅜ to 6⅝	Free	4c. per pound on copper content.
Light copper	5½ to 5¾	Free	
Heavy yellow brass	3⅜ to 3⅝	Free	
Light brass	3 to 3⅛	Free	
No. 1 composition	4⅞ to 5⅛	Free	
Composition turnings	4⅝ to 4⅞	Free	
Heavy soft lead	3 to 3¼	2⅛c. lb.	None.
Old zinc	2¼ to 2⅜	1½c. lb.	
New zinc clips	2¾ to 3	1½c. lb.	
Aluminum clips (new, soft)	12¼ to 13¼	4c. lb.	
Scrap aluminum, cast	9¼ to 10	4c. lb.	
Aluminum borings—turnings	5 to 5½	4c. lb.	
No. 1 pewter	30 to 32	Free	
Electrotype or stereotype	2⅞ to 3	2⅛c. lb.*	
Nickel anodes	30 to 33	10%	
Nickel clips, new	31 to 33	10%	
Monel scrap	11 to 18½	10% a.v.	

*On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' price lists, effective since November 24, 1934. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

COPPER MATERIAL

	Net base per lb.	Duty*
Sheet, hot rolled	16c.	2½c. lb.
Bare wire, soft, less than carloads	12.75c.	25% a. v.
Seamless tubing	16.25c.	7c. lb.

*Each of the above subject to import tax of 4c. lb. in addition to duty, under Revenue Act of 1932.

NICKEL SILVER

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	23.50c.	10% Quality	26.375c.
15% Quality	25.625c.	15% Quality	30.75c.
18% Quality	26.875c.	18% Quality	34.00c.

BRASS AND BRONZE MATERIAL

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	
Sheet	14¼c.	15¼c.	16	4c. lb.	U. S. Import Tax 4c. lb. on copper content.
Wire	14¾c.	15¾c.	16½	25%	
Rod	12¾c.	15¾c.	16⅜	4c. lb.	
Angles, channels	22¼c.	23½c.	24	12c. lb.	
Seamless tubing	16 c.	16¾c.	17⅝	8c. lb.	
Open seam tubing	22¼c.	23½c.	24	20% a. v.	

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound. (Duty 4c. lb.; import tax 4c. lb. on copper content.)

Tobin Bronze Rod	16¼c.
Muntz or Yellow Rectangular and other sheathing	17¾c.
Muntz or Yellow Metal Rod	13¾c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	.32.80
Aluminum coils, 24 ga., base price, tons lots, per lb.	.30.50

ROLLED NICKEL SHEET AND ROD

Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	.35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	.40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (May 2) 71¼c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.50	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' price)	10.25	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' price)	14.25	2c. lb.
Full Lead Sheet (base price)	7.25	2⅛c. lb.
Cut Lead Sheet (base price)	7.50	2⅛c. lb.

BLOCK TIN, PEWTER AND BRITANNIA SHEET

(Duty Free)

This list applies to either block tin or No. 1 Brittannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. or over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Supply Prices on page 192.

Supply Prices, May 2, 1935

ANODES

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 500 lbs. or more, and subject to changes due to fluctuating metal markets.

Copper: Cast .... 16½c. per lb.
Electrolytic, full size, 14c.; cut to size 14c. per lb.
Rolled oval, straight, 14½c.; curved, 15½c. per lb.
Brass: Cast .... 14½c. per lb.
Zinc: Cast .... .08⅝c. per lb.

Nickel: 90-92% .... .45 per lb.
95-97% .... .46 per lb.
99%+cast, 47c.; rolled, depolarized, 48.
Silver: Rolled silver anodes .999 fine were quoted May 2, from 73½c. per Troy ounce upward, depending upon quantity.

WHITE SPANISH FELT POLISHING WHEELS

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$2.95/lb.	$2.65/lb.	$2.45/lb.
10-12-14 & 16	2 to 3½	2.85	2.55	2.35
6-8 & over 16	1 to 2	3.05	2.75	2.55
6-8 & over 16	2 to 3½	3.00	2.70	2.45
6 to 24	Under ½	4.25	3.95	3.75
6 to 24	½ to 1	3.95	3.65	3.45
6 to 24	Over 3½	3.35	3.05	2.85
		Any Quantity		
4 to 6	Under ½, $5.00	½-1, $4.85	1 to 3, $4.75	
1½ to 4	" 5.55	" 5.40	" 5.35	
1 to ½	" 5.85	" 5.70	" 5.60	

Extras: 25c per lb. on wheels, 1 to 6 in. diam., over 3 in. thick.
On grey Mexican wheels deduct 10c. per lb. from above prices.

COTTON BUFFS

Full disc open buffs, per 100 sections when purchased in lots of 100 or less are quoted:

16" 20 ply 84/92 Unbleached	$80.12
14" 20 ply 84/92 Unbleached	61.43
12" 20 ply 84/92 Unbleached	46.21
16" 20 ply 80/92 Unbleached	67.00
14" 20 ply 80/92 Unbleached	51.47
12" 20 ply 80/92 Unbleached	38.80
16" 20 ply 64/68 Unbleached	59.18
14" 20 ply 64/68 Unbleached	45.48
12" 20 ply 64/68 Unbleached	34.35

⅜" Sewed Buffs, per lb., bleached or unbleached 49c. to 1.12

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P.	lb.	.13½-.16
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.04½-.05
Chromic, 400 or 100 lb. drums		.15¾
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.03
Hydrochloric, C. P., 20 deg., carboys	lb.	.06½
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.05-.06¼
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl, drums	lb.	.13½-.14½
Denatured, drums	gal.	.475-.476
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.05
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02½-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½.-05
Sulphocyanide, technical crystals, kegs	lb.	.55-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.02¼-.02¾
Cadmium oxide, 50 to 1,000 lbs.	lb.	.65
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.06
Chrome, Green, commercial, bbls.	lb.	21½-23½
Chromic Sulphate, drums	lb.	.33-.55
Copper—Acetate (Verdigris)	lb.	.21
Carbonate, 53/55% cu., bbls.	lb.	.14½-.16½
Cyanide (100 lb. kgs.)	lb.	.38-.40
Sulphate, tech., crystals, bbls.	lb.	4.55-5c.
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus Martis (Iron Oxide) red, tech., kegs.,	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.21-.31
Iron Sulphate (Copperas), bbls.	lb	.01½
Lead—Acetate (Sugar of Lead), bbls.	lb.	.10-.13½
Oxide (Litharge), bbls	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) 100% synth., drums	gal.	.42½
Nickel—Carbonate, dry, bbls.	lb.	.35-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.13-.14
Salts, double, 425 lb. bbls.	lb.	.13-.14
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07¼-.08⅝
Potassium—Bichromate, casks (crystals)	lb.	.07⅞
Carbonate, 96-98%	lb.	.08¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½
Gold Cyanide	oz.	$15.45*
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge—Nickel, 100 lb. lots	lb.	.08
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	*
Cyanide, 100 oz. lots	oz.	.72½
Nitrate, 100 ounce lots	oz.	*
Soda Ash, 58%, bbls.	lb.	.0252
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.17½-.22
Beryllium fluoride (2NaF. BeF_2)	lb.	4.30-7.00
Gold Cyanide	oz.	$17.10*
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	3.55-3.70
Nitrate, tech., bbls.	lb.	.02¼
Phosphate, tribasic, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01¼
Stannate, drums	lb.	.33½-.36½
Sulphocyanide, drums	lb.	.30-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.38
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.11-.12
Cyanide (100 lb. kegs)	lb.	.38
Chloride, drums, bbls.	lb.	.07½-.10
Sulphate, bbls.	lb.	.03-.037

* Gold and silver products subiect to fluctuations in metal prices.

METAL INDUSTRY

With Which Are Incorporated
COPPER AND BRASS
BRASS FOUNDER AND FINISHER
ALUMINUM WORLD
ELECTRO-PLATERS' REVIEW

Address all correspondence to Metal Industry, 116 John St., New York. Telephone, BEekman 3—0404. Cable Address Metalustry.

PALMER H. LANGDON..Editor and Publisher
ADOLPH BREGMAN........Managing Editor
THOMAS A. TRUMBOUR..Business Manager
EVAN J. ROBINSON....Advertising Manager

Member of Audit Bureau of Circulations

Published Monthly—Copyright 1935 by The Metal Industry Publishing Company, Incorporated; Entered February 25, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879.

SUBSCRIPTION PRICES: United States, \$2.00 Per Year; Canada and Foreign \$2.50. SINGLE COPIES, 20 CENTS. Please remit by check or money order; Cash should be registered. Advertising Rates on Application. Forms Close the First of the Month.

Vol. 33 JUNE, 1935 No. 6

TABLE OF CONTENTS

METAL INDUSTRY articles are listed regularly in the "Engineering Index" and "Industrial Arts Index"

Buyers' Guide, Advertising Page 43